EXPERIENCING INFORMATION:

USE OF PATTERN AS A MECHANISM IN ARCHITECTURAL DESIGN

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By

Joshua E. Shishido

DArch Committee:

Marja Sarvimaki, Chairperson
Bryce Uyehara
Jacob Koseki

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Abstract

It is imperative for architects to design and build projects in a responsible way. This equates to many factors such as structural stability, environmental sustainability, attention to cultural issues, and honesty towards a client. One specific duty of the architect is to design buildings that communicate their meaning clearly. This has become an especially challenging task as a more conceptually based design approach has become the norm in architectural practice. When the design idea or concept is taken from beyond the field of architecture, it can produce innovative works when executed successfully, or arbitrary designs when executed unsuccessfully. This project proposes a medium – which will be referred to as the use of pattern as a mechanism – with which concepts can be executed clearly, consistently, and in a highly integrated way with the many other tangible and intangible components of an architectural design. The logic on which the medium is based is derived from the writings of an anthropologist and systems thinker named Gregory Bateson. While the project does not propose that the medium is completely universal and full proof such as the nature of a mathematical equation, it does propose that the idea is highly flexible and adaptable to a range of applications. Therefore, the research attempts to test the idea in the execution of a conceptually based design of a visitor interpretation center located on the North Shore of ‘Oahu. The particular project has been selected because of its highly sensitive physical and theoretical context. Should a concept approach be used in such a situation, it would be crucial that the concept not only be appropriate, but just as importantly, clearly and tactfully executed. It is hoped that the functionality of this project’s notion of pattern in executing a design concept in this particular context will further validate it if it can be successfully applied.

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Chapter 1. Introduction

1.1 Research Background

The Double Edged Sword of Conceptual Design

While this project is focused on exploring a very specific notion of pattern in architectural design, the reason for investigating the idea is rooted in my interest in a greater endeavor to explore means through which a design idea–or perhaps a more appropriate term–a design 'concept,' can be successfully executed in architectural design. I measure the success of this task through the ability for a building user to experience the indented design concept without prior knowledge of it and using only his or her basic realms of perception.

Several architects and scholars have supported the opinion that a conceptual approach, or at least ideas from outside the profession such as art, is healthy for the profession: Juhani Pallasmaa writes that 'We have to admit that our discipline of architecture does not possess a theory of its own – architecture is always explained through theories that have arisen outside of its own realm.'[1] He references Alvar Aalto in his statement that '…Nearly every design task involves tens, often hundreds. sometimes thousands of different contradictory elements, which are forced into a functional harmony only by mans will. This harmony cannot be achieved by any other means than those of art.'[2]

Despite its potential, a concept, theory, or otherwise artistic approach to architecture also has many dangers. These dangers are also recognized by prominent architectural thinkers: In the same article as his above quote, Pallasmaa writes that 'In our time, however, theoretical and verbal explanations of buildings have often seemed more important than their actual design, and intellectual constructs more important than then the material and sensuous encounter of the built works. The uncritical application of various scientific theories to the field of architecture has often caused more confusion than a genuine understanding of its specific essence.'[3] Supplementing this opinion, Palaasmaa quotes Louis Kahn in his highly poetic statement that 'A painter can paint

[1] Juhani Pallasmaa, "New Architectural Horizons," *Architectural Design* 77 (2007): 17.
[2] Ibid., p. 19.
[3] Ibid., p. 18.

square wheels on a canon to express the futility of war. A sculptor can carve the same square wheels. But an architect must use round wheels.'[4]

Given the current status of concept architecture as a form of double-edged sword, this project explores a form of 'tool' for dealing with the uncertainty that comes with the attempt to critically 'realize' a design concept in architecture. It is not a universal, full-proof method or equation per say, as I believe there is no such thing in architectural design. However, the idea is more along the lines of a *medium* that could be used for the task if the situation allowed, such as the way bricks are an option for building a wall, or a lamp is one means of providing illumination of a room. It could be said that the idea attempts to *balance* 'intellectual construct' and 'sensuous encounter' rather than the allowing the former to dominant the latter as Pallasmaa describes is often the case.

As a side note, I surmise that this research direction is largely due to the architectural education I have received which has almost always stressed a highly conceptual approach to architecture, leaving me investing a significant amount of time and abstract thought–not so much in creating concepts–but more so in exploring ways to harmoniously implement them through the inherently archaic physical body of architecture.

A Functional Use of Pattern

It should be carefully noted that the following research is an attempt to define *a means of achieving a design concept*. It is not a design concept, nor a design theory, but more simply, a *medium* synonymous to a medium such as material, a color pallet, or a structural system. The medium this research refers to–the use of pattern as a form of 'mechanism' for producing information–is one that is synonymous to other more physical mediums in architecture, but difficult to define as such because it is a product of human perception. Simply put, the essence of the medium is predominantly a product of organization.

I became interested in exploring this very specific notion of pattern for my graduate research after I designed and developed façades for a theatre and music hall during a four-month internship in Beijing, China (figure 4). When I was given the task to

[4] Juhani Pallasmaa, "New Architectural Horizons," *Architectural Design* 77 (2007): 21.

design the façades, the building forms, floor plans, and exterior 'canopy' structure that enclosed the buildings had already been fixed. Based on my feeling that these three components had been developed somewhat inharmoniously in respect to one another, I made it my goal to mediate the issue by creating a dialogue between them, using the facade. This dialogue was the *concept* that I established for myself to design the facade through.

I tried not to think of the design of the façade as an expression of my own ideas and thoughts, but rather, one that was purely derived from the three disparate components and driven by the task of integrating them. The strategic way that I went about relating the two building forms, their floor plans, and exterior canopy was rigorous and systematic. I wanted their relationship to be 'embedded' in the façade as much as possible. I thought that if nothing was arbitrary about the façade (its material, color, dimensions, function, etc.) and if every component was related in someway to the next, one could 'trace' the relationship between the building forms, the floor plans/use, and the exterior canopy through the composition of the skin. I accomplished this through a use of repetition, intervals, multiples, symmetry, ranges, and some degree of intuition.

Demonstrated in figure 1, two different assemblies were designed such that each incorporated two materials to compose lattice elements, aluminum and timber. In both assemblies (pink and blue) the dimensions of the individual lattice elements and the spacing between them occur in multiples of 50mm because that was the thinnest possible dimension of the smallest metal lattice. The width of each assembly as a whole was determined by the floor height of the music hall. A combination of symmetry, repetition, and slight variation enabled them to achieve a balance between uniformity and randomness.

The ultimate goal of the assemblies was that they could each allow for a range of porosity so they could be used as a means of accommodating different levels of privacy determined by the floor plan (which was constantly being altered). This privacy range is reflected in the three assembly variations in figure 2 (right side). The darkest shade of grey indicates the lowest level of privacy necessary and is achieved with an absence of lattice elements, the medium shade of grey indicates a moderate level of privacy necessary and is achieved by only the metal lattice elements being present, and the

lightest shade of grey indicates the highest level of privacy necessary and is achieved by both timber and aluminum lattice elements being present. The dimension of the individual lattice elements and spacing between them were designed to accommodate appropriate visibility and safety (according to code) in each 'mode' of privacy. All levels of privacy can be achieved consistently by each assembly while maintaining some variation because of their strategic arrangement. Shown on the left side of figure 2 is the ability of the two different façade assemblies to be interchanged in a one to one rhythm that appears as a one fluid assembly.

Shown in the unrolled elevations of each building in figure 3 is ability for the assemblies to function in a way that accommodates both forms aesthetically and functionally. It can be observed that despite the differences in form and interior function of both buildings, the assemblies are able to accommodate them using the same system.

The renderings in figure 4 show a result of the façade assembly designs that is not immediately visible in the diagrams. This result (as well as my desire to explore how the conceptually based architecture can be more 'objectively realized') is what led to the specific topic of this dissertation. **Because the design of the assemblies was based rigorously on *repetition*, one can easily perceive a 'dialogue' between the two different building forms and canopy (the design 'concept'). The design's criticalities about what components are repeated (materials, dimensions, ranges of porosity, correspondence with interior functions, etc.) contributes to the operation, however it is arguable that the raw element of *repetition* or *patterning* of the components and how they are repeated or patterned is the main component that enables the phenomenon. For the simple fact that when we experience *more* of something–regardless of what realm of perception we experience it through–we understand it better. The idea is simple yet because it is simple, it has much potential. Perhaps much more potential than we give it credit for, especially in architecture.**

After designing the façade and doing some preliminary research about the idea, I decided to form my M. Arch thesis based on the notion that repetition–or a specific understanding of pattern–can act as a form of 'mechanism' in architecture when it is understood as such. In that document it was my aim to show that **pattern can in fact produce a form of *information* that is embedded in architecture, or in other words,**

localized to a specific place. I also intended to show that this specific use of pattern can be used as a flexible 'medium' in design for carrying out a wide range of design concepts and theories in a highly objective matter. With the support of ideas proposed by an anthropologist and systems thinker named Gregory Bateson, a handful of writings on pattern in architecture by various individuals, and analyses of case studies, the research was successful. The arguments and findings from that thesis document compose much of the research portion of this dissertation.

In addition to refining the written research in my M. Arch thesis, this D. Arch document adds to the strength of its argument in a section entitled *Additional Support* (section 2.4). In this section, writings by Tyler Volk, Jefferey W. Bloom, John Richards, Peter Eisenman, and Noel G Charlton are used as further evidence of the argument that pattern can be used to produce a form of localized information.

In the design research section of the dissertation, I will attempt to demonstrate the applicability that pattern (when deployed as a mechanism) has in executing a concept based design through the design of a visitor interpretation center in the north shore of Hawai'i. The purpose of this research tests the findings of my M. Arch thesis and addresses my greater endeavor to explore how the 'design concept' can be more objectively realized in architecture. It tests the findings of the prior research not just in any a design project, but applying them in a situation where a highly conceptual approach is used.

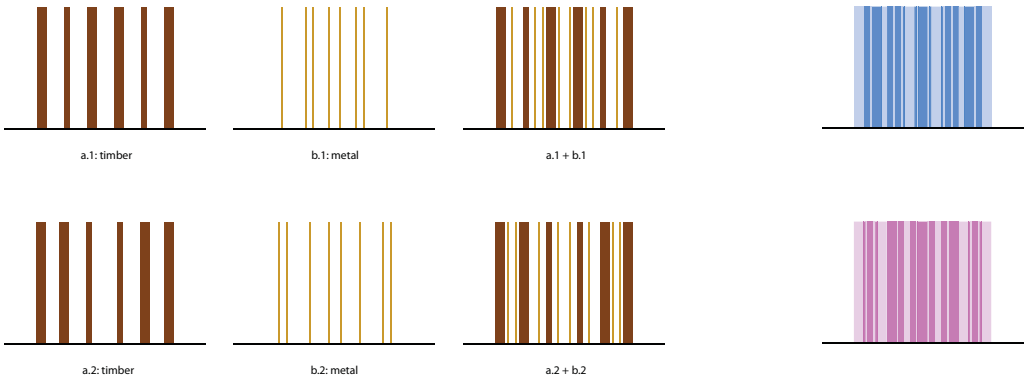

Figure 1. Assembly Organizations

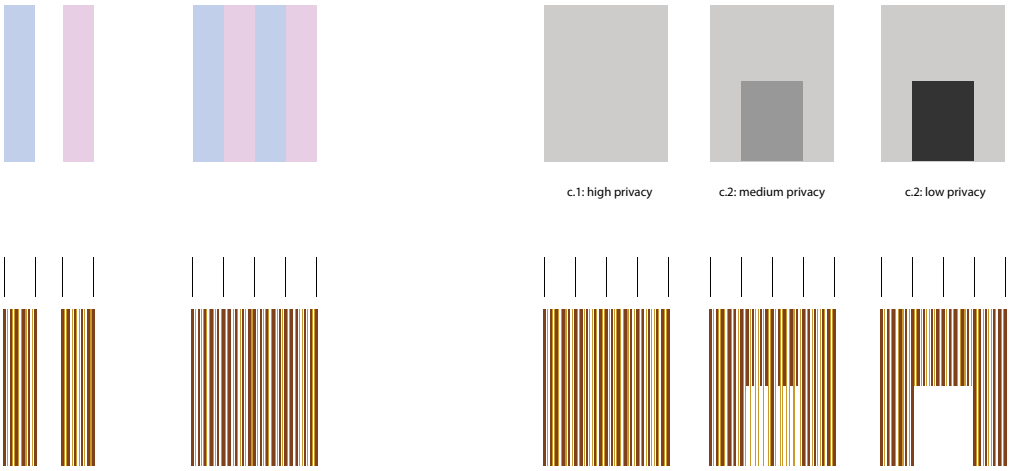

Figure 2. Use of Assembly Organizations (micro)

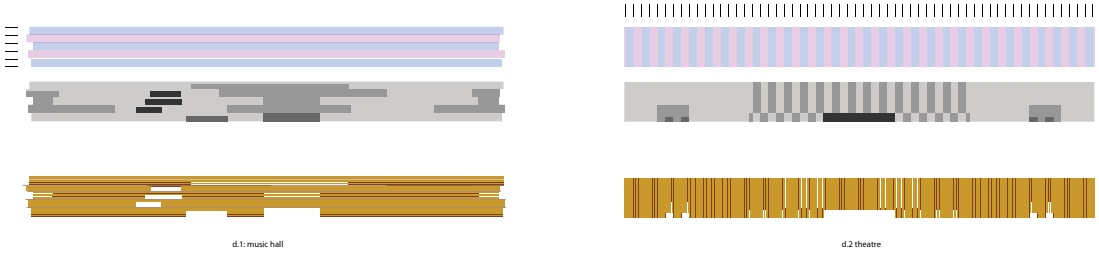

Figure 3. Use of Assembly Organizations (macro)

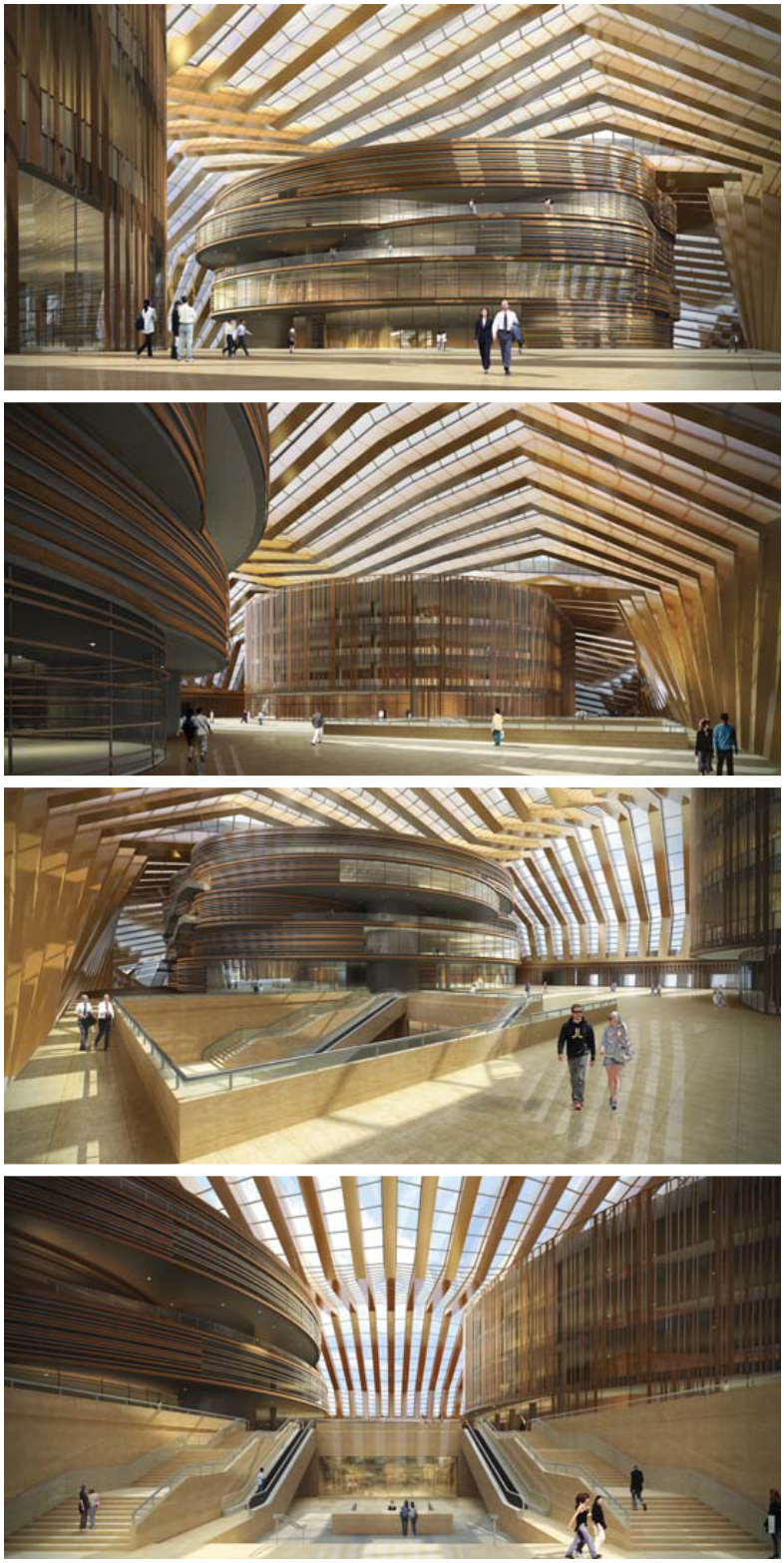

Figure 4. Façade Design Perspective Renderings

1.2 Understandings of Pattern in Relation to Architecture

There are a number of ways that the element of pattern is defined in architectural design. Therefore it is necessary to explain the relatively uncommon definition of pattern that this project hopes to establish, through its relationship to others that are more commonly held in architecture.

Common definitions of pattern in architecture could be broken into four categories, which include pattern as occurrence, pattern as decoration, pattern as mimicry, and pattern as language. These are the first four definitions described in the following section. The fifth definition–pattern as a form of mechanism–is definition investigated by this research. It should be noted that the following pictures do not adequately define the four definitions of pattern that are being explained, but rather, only serve as visual references. In order to avoid confusion, it is necessary to interpret the pictures in conjunction with the verbal descriptions.

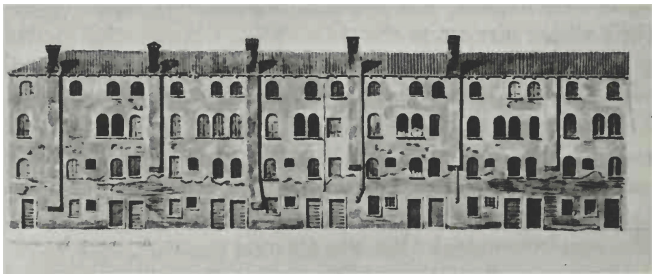

Figure 5. Pattern as occurrence in architectural design (Steen Eiler Rasmussen, *Row-houses from the 15th century in Calle dei Preti near Via Garibaldi in Venice*, 1962, black and white sketch, *Experiencing Architecture*, by Steen Eiler Rasmussen (Cambridge, MA: M.I.T. Press, 1962), 132.)

The definition of pattern as an occurrence in architecture (figure 5) is best exemplified in a section entitled 'Rhythm' by Rasmussen in *Experiencing Architecture*. Through the subject matter of the book, which is concerned with the experience of architecture, pattern is defined (in this case, a sequential pattern or rhythm) as an effect of the components of architecture such as window module, spatial layout, or structural grid. Rasmussen explains that pattern is part of the inherent nature of architecture, and therefore, pattern is often an occurrence.

Figure 6. Pattern as decoration in architecture (Patrick Gruban, *Alhambra*, April 19, 2005, color photo, Flickr, Accessed March 26, 2015. <https://www.flickr.com/photos/gruban/11341048/>)

Perhaps more of a conscious use of pattern compared to the last example is the definition of pattern as decoration (figure 6). The definition of pattern as decoration, symbol, motif, or the like, is demonstrated in the above photo of a wall in Alhambra Palace in Granada, Spain. In this case, pattern is understood as an element that is often added or applied to components of architecture, usually with decorative purpose. This definition of pattern is arguably driven by a view of pattern as a work of art in itself.

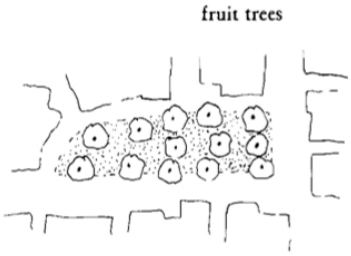

Figure 7. Pattern as language in architectural design (Christopher Alexander, *fruit trees*, black and white drawing, *A Pattern Language: Towns, Building, Construction*, by Christopher Alexander (Oxford, UK: Oxford University Press, 1977), 796.)

The definition of pattern as a language in architecture is demonstrated by Christopher Alexander in *A Pattern Language* (figure 7). Like the previous definition, Alexander's definition of pattern as a language demonstrates a conscious use, however, it is different in that it sees pattern as a design methodology rather than an object that is applied to architecture. Exhibited in the above diagram, Alexander's definition of pattern as a language is less focused on the aesthetic of pattern, and more focused on how it is able to function. Shown in the above diagrams is the notion that Alexander's definition of pattern as a language is not bound to the two-dimensional components of architecture.

Figure 8. Pattern as mimicry in architectural design (Charlie Fong, *The National Aquatics Center at Night*, December 31, 2008, color photo, Wikipedia, Accessed March 27, 2015. <http://en.wikipedia.org/wiki/Beijing_National_Aquatics_Center>)

The definition of pattern as mimicry in architecture is demonstrated in the cases where pattern is a replication or copy of patterns from sources beyond the field (figure 8). In the above examples of biomimicry, pattern is used explicitly to translate patterns found in nature (bubbles and honeycomb) to patterns in architecture. This definition of pattern could be seen as a product of the following definition of pattern, however, it has been distinguished from it because of its common emphasis on the element of mimicry over anything else.

difference, redundancy, coding > localized information

Figure 9. Pattern as a 'mechanism' in architectural design

The definition of pattern that this research investigates can be described as the use of pattern as a form of 'mechanism' for producing localized information (information restricted to a particular place) in architecture. This function of pattern was originally defined by an anthropologist and systems thinker named Gregory Bateson and related to architectural design by Paul Andersen and David Soloman. The definition is demonstrated in the above figure (figure 9) but will be further explained in the following research. It should be noted that the use of pattern as a mechanism is not driven by a certain form (ie. diamond geometry, polka dots, grid, etc.), but instead, *a strategic relationship between the parts of pattern*.

With that being said, the goal of this research project is to establish the ability for pattern to produce localized information from architecture, as well as explore specific purposes it has in executing theories and concepts in architectural design.

Can pattern be used for producing a form of localized information in architecture and in doing so be used as a means of objectively executing the highly concept based design objectives that has almost become the norm in contemporary practices? Based on the writings of Paul Andersen, David Soloman, and Gregory Bateson, it is hypothesized that this is possible.

1.3 Research Methodology

Research methods include narrative research, case study analyses, and design research. The research process begins with narrative research of individuals who have defined and discussed the use of pattern as a mechanism in architectural design. Based on this research, a definition of pattern as a mechanism in architecture is formed. Using this definition, a range of case studies are analyzed that demonstrate pattern being used as a mechanism for producing localized information from architecture. These case studies include information on the physical project, design concepts and methodologies used, and graphic analyses. Finally, the knowledge gained during these phases of research is tested in a conceptual design project in Hawai‘i.

The primary bodies of knowledge that will be used to support the written research primarily includes writings by Gregory Bateson, Paul Andersen, and David Soloman, on achieving concept based architecture, resources on the physical, conceptual, and methodological aspects of the case study projects, as well as writings on ideas and theories in critical regionalism, phenomenology, transparency, and concept and the land art movement in architecture. The body of knowledge used to support design research includes those used to produce the findings of the written research, resources on physical and cultural aspects of the project context, and resources on selected precedent projects. A number of diagrammatic/graphic analyses are also used as evidence and are my own if not otherwise indicated.

1.4 Significance of Research

The significance of this research is it outcome establishing the ability of pattern to function as a diverse, effective, and critical tool in architectural design. Because pattern has been widely used in highly uncritical ways in the past, it has gained an unfavorable

reputation in the field of architecture and many architects have shied away from using it in architectural design. Recently however, the use of pattern architecture has increased and several individuals have discussed its unique abilities when used with discretion. This project adds to the view of pattern as a critically functional component in architecture that is currently surfacing.

While the research's primary contribution is making an argument regarding a specific functionality of pattern in architectural design, it also shows through its case studies and design focus that the use is highly appropriate for realizing concepts, idea, and theories in architectural projects. Thus it also contributes to the field of knowledge that discusses the challenges in concept-based architecture.

Finally, another contribution of this research is it's capability to strengthen the connection between the theories of anthropologist Gregory Bateson and the discipline of architecture. Bateson's transdisciplinary work has influenced multiple fields such as anthropology, biology, business, and psychology. This research adds to this list of applications of Bateson's work across disciplinary borders.

Chapter 2. The Production of Localized Information from Pattern

2.1 Andersen and Soloman

A Unique Understanding of Pattern

After observing an increase in the use of pattern in contemporary architecture initiated by the advent of computer aided design, Paul Andersen and David Soloman investigated the definition of pattern held by individuals from various disciplines to evaluate what direction they may offer in theorizing the usage. Among architect Christopher Alexander, a chemist named Ilya Prigogine, an art educator named Gyorgy Kepes and an anthropologist named Gregory Bateson, the authors found that the understanding of pattern held by Bateson has 'certain advantages' for use in architecture.[5] Andersen and Soloman saw his 'desire to combine redundancy and noise' as offering architects the ability to use pattern as means of linking 'form and information,' and 'matter and thought.'

With the specific interest in exploring the latter ideas, or more definably–the ability to produce information from architecture through pattern–this project expands Andersen and Soloman's application of Bateson's understanding of pattern to architectural design. It accomplishes especially through investigation of Bateson's writing on redundancy, noise, coding–which Andersen and Soloman pointed out are the essential components in the anthropologist's understanding of pattern–in order to identify specifically how pattern can be used practically in order to produce information from architecture.

Understanding Gregory Bateson

Before interpreting Bateson's writing it is helpful to understand the ontology and epistemology that he maintained. These views are the basis of this research as well. The below quote by Noel G. Charlton explains Bateson's unique understanding of the world

[5] Paul Andersen and David Soloman, "The Pattern That Connects." Proceedings of the 30th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), New York, October 21-24, 2010.

and the element of pattern.[6]

> Some scholars (e.g., Dell 1985) have claimed that Bateson failed to set out ontology. What these critics fail to understand is that Bateson *conflates* ontology and epistemology. That is, he brings together and merges his understanding of *what* is there to be known in the world with his understanding of *how we can know* about it. By his claim that (given the fallibility of our sensory awareness) what can be known about the world is equivalent for all practical purposes to what is understood *to exist*, he unifies epistemology and ontology and transcends the whole idealism/realism argument. (p.43)

Bateson desired to conflate, or merge, what there is to be known about the world (ontology), and how we can know about it (epistemology). In other words, he wanted to find a means of linking the world in its physical and mental aspects. In his desire to do so, the anthropologist found pattern itself to be the means through which such a task was possible. Unlike traditional sciences and written which separates what there is in the world and how we can know about it pattern, or 'redundancy' links the two dimensions. In addition to it being embedded in the physical world, redundancy is at the same time a form of communication, or a means by which we can know about the world. Thus, pattern is phenomenological and archaic but at the same time, technological and advanced.

Because of his views epistemological and ontological views, Bateson's work did not 'fit' into any single discipline. However, because of these views, it intersected a wide range of disciplines. Perhaps the most well known product of Bateson's work was his creation of the double bind theory. It proposes a dilemma can occur in communication where an individual or group receives two or more conflicting messages where one message clearly negates the other. It was through this theory that Bateson proposed the schizophrenia was not an inborn condition, but a result of confusion in thinking. In addition to psychology, Batson's theories have been considered in fields such as biology, anthropology, social sciences, linguistics, and (with Andersen and Soloman's brief investigation) architecture. It is with this understanding that the following research should be digested.

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[6] Noel G. Charlton, 2008. *Understanding Gregory Bateson: Mind, Beauty, and the Sacred Earth*. State University of New York Press: New York.

2.2 Producing Information from Redundancy and Coding

Redundancy and Coding

Through a pair of essays in *Steps to An Ecology of the Mind*,[7] entitled *Cybernetic Explanation* and *Redundancy and Coding* Bateson defines the logic of how the element of redundancy, separate and indiscriminate of the events or objects that may compose it, is capable of carrying information and communicating meaning. This explanation begins with the example that if we are given a piece of English prose that is missing a letter, we are able to predict the letter that is missing. This is not only because we know the meaning of letters and words, but also *partially* because the location of a letter in a given word or sentence is not completely random. In cybernetic thinking (the study of information carried by objects or events rather than the objects or events themselves) the reason that the prediction is possible is due to fact that there are only twenty-six letters in the alphabet and some letters and combinations of letters occur more commonly than others.

Th_ boy r_ad a book
1. mean
2. cream
3. being

Figure 10. Sample of English prose

Understandable through the individual words, 'mean,' 'cream,' and 'being,' in example in figure 10 is the notion that there is a redundancy or pattern-ing embedded in English prose that partially informs one that it is the letter 'e' which is missing from the phrase. The three individual words all provide information that it is the 'e' that is missing from the sentence. This type of information is not achieved through the meaning of the words, but instead, through their spreading of redundancy. A simpler example can be observed in the below series of numbers in figure 11.

[7] Gregory Bateson. *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc,1972).

2, 7, 3, 8, 11, 14, 27 (X=27)
2, 7, 3, 8, 11, 14, 27
2, 7, 3, 8, 11, 14, X

Figure 11. Example of redundancy as information

Without receiving information that X=27, we are able to guess with better than random success that X=27. This is because the information that enables one to guess that X=27 is present in the set through redundancy. Like the redundancy embedded in English prose, there is a redundancy embedded in the set of numbers that enables it to carry information or 'coding' that is separate from the meaning of the symbols (numbers).

While the above examples exhibit the ability of redundancy to carry information used in the communication between humans, Bateson argues that it is a consistent phenomenon in our, and all other organism's processes of perception in general. For example, when we see only the top part of a tree (figure 12), it is possible for us to guess with better than random success that the tree has roots which extend beneath the ground. Through redundancy, the top part of the tree is encoded with, or contains information about the parts not present.

Figure 12. Tree (Floyd Wilde, *00027*, December 9, 2005, color photo, Flickr, Accessed March 27, 2015. < https://www.flickr.com/photos/15416579@N00/79869767>)

Bateson then goes on to show that within any system where there is redundancy, an individual is often able to guess with better than random success at parts missing from an incomplete 'message.' The example he uses in this case is the situation in which individual A is given the message by individual B that "it is raining." When individual A looks out the window and receives information that it is raining from the perception of raindrops, he or she receives *less information* had they not received the message from

individual B. Before looking out the window, individual A could have guessed with better than random success that he or she would have seen rain from the receiving of the message. The reasoning behind this is that the act of receiving the incomplete parts is a message itself, and is therefore part of a 'universe of messages.' Likewise, the parts that cannot be perceived are part of a 'universe of external phenomena.' The two universes are part of a greater universe of the 'universe of message plus external phenomena,' which itself carries redundancy.

> As I see it, if the receiver can guess at missing parts of the message, then those parts which are received must, in fact, carry a *meaning* which refers to the missing parts and is information about those parts. (Bateson) [8]

Noise as a Form of Redundancy and Information

Bateson suggests the possibility that an object or event that 'interrupts' the 'intentions' of a message created through redundancy is not something to be avoided, but instead, a possible source of new information also created through redundancy. This scenario is portrayed in the below figure 13.

Set A:	2, 7, 3, 8, 11, 14, 27	(X=27)
	2, 7, 3, 8, 11, 14, 27	
	2, 7, 3, 8, 11, 14, 16	
	2, 7, 3, 8, 11, 14, X	
Set B:	2, 7, 3, 8, 11, 14, 16	(X=16)
	2, 7, 3, 8, 11, 14, 16	
	2, 7, 3, 8, 11, 14, X	

Figure 13. Example of 'noise' as information

While some might view the last sequence in set A as interruption or 'noise' (a term used in cybernetics as anything that infiltrates a closed system) within the set, Bateson would view it as just as much as a form of information as the first two sequences in the set. Although set B may not be immediately present (indicated by its

[8] Gregory Bateson. *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc,1972), 421-422.

translucency), Bateson would see the sequence as carrying meaning of *new* patterns/information; he would see it as an indication of set B.

> All that is not information, not redundancy, not form and not restraints–is noise, the only possible source for *new* patterns. (Bateson) [9]

2.3 *The Pattern That Connects*

In *Mind and Nature: A Necessary Unity*, Bateson uses the above logic in an attempt to 'construct a picture of how the world is joined together in its mental aspects.' [10] He refers to this theory as 'the pattern that connects,' 'the pattern of patterns,' and 'metapattern.'[11] The text introduces a handful of principles that are driven by the logic expressed in previous section which can be defined as 'perception operates only upon the news of difference,' 'information consists of differences that make a difference,' 'an increment of insight is provided by a second language of description without the addition of any extra objective information,' and 'all communication necessitates context, and without context, there is no meaning.'

Through various examples, Bateson explains that while science is a way of making sense of our perceptions, perception itself operates only upon the news of difference. To illustrate and emphasize the point, Bateson discusses the nature of perception as analogous with a switch, or engineering terms–a gate or relay (figure 14).[12]

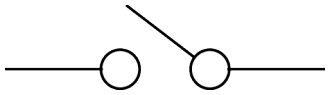

Figure 14. Diagram of a switch

A switch *does not exist* when it is in the on or the off position. From the point of view of the circuit of which it is a part, when a switch is in the 'on position,' it is no different from the conducting wire that leads in and out from it. Similarly, when it is in the 'off position,' the switch is only a gap in the conducting wire. In actuality, the switch

[9] Gregory Bateson. *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc,1972), 418.
[10] Gregory Bateson. *Mind and Nature: A Necessary Unity*. (New York: E.P. Dutton, 1979), 19.
[11] Ibid., p. 11.
[12] Ibid., p. 108.

'exists' only at the moment of its change of setting between 'on' and 'off.' Bateson writes that a switch has a special relation to the notion of time and change rather than object.

Bateson explains the principle that information consists of differences that make a difference. In relation to the previous principle, it could be said that like perception, information only 'exists' when it makes a difference. To explain the idea, Bateson refers to Kant and the notion that a piece of chalk contains a million *potential* facts, but only a few actually *become* facts.[13] Bateson finds that Kant's fact can be substituted for difference in the sense that the piece of chalk contains an infinite amount of potential differences, but only a few become *effective* differences or in other words, information. An example of the piece of chalk creating an effective difference would be if one were to call attention to difference between the chalk and a piece of cheese, and in so doing, cause one to avoid eating the chalk or tasting to verify the statement. Furthermore, Bateson takes the standpoint that Bishop George Berkeley was correct in asserting that if a tree falls in a forest and he is not affected by it, then it is meaningless.

Through various examples, Bateson calls attention to the idea that 'an increment of insight is provided by a second language of description without the addition of any 'extra objective information.' [14] Some examples Bateson uses to demonstrate the phenomenon are the cases of binocular vision, mathematical theorems, and piano tuning. Binocular vision demonstrates that although both eyes focus on the same region, the data collected by one eye combined with the data collected by the other, produces the a higher resolution image, the ability to see in low lighting, and the creation of depth. In mathematics, it is demonstrated that a student is able achieve a better understanding of a relationship when given two different ways in can be proved (such as the below algebraic and geometrical explanation of the binomial theory). Finally, in musical situations such as the tuning of pianos, beats are produced when two sounds of different frequency are combined.

[13] Gregory Bateson. *Mind and Nature: A Necessary Unity*. (New York: E.P. Dutton, 1979), 99.
[14] Ibid., p. 73.

$(a+b)^2 = a^2 + 2ab + b^2$

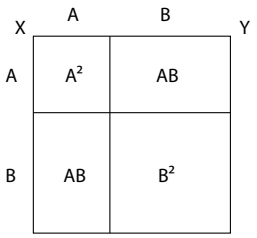

Figure 15. Algebraic and geometrical explanations of binomial theory

In discussing the nature of communication, Bateson argues that all communication necessitates context, and without context there is no meaning.[15] Of particular importance to this project is the way his distinction between spatial and temporal context, and the idea that the latter is more trivial and nonsensical than the former. This is exhibited in Bateson's quotation of Johan Wolfgang von Goethe's description of a plant.

> "A stem is that which bears leaves."
> "A leaf is that which has a bud in its angle."
> "A stem is what was once a bud in that position." [16]

Demonstrated by the description is the view of context as that which not only gives meaning, but also that which is inseparable from meaning. This is opposed to a more scientific or temporal definition of a plant in terms of scientific taxonomy (ie. kingdom, phylum, class, series, family, genus, species).

2.4 Strategies for Producing Localized Information from Pattern

While the previous two sections demonstrated ways in which Bateson observed localized information *being produced* from pattern, redundancy, coding, noise, etc., there are moments in the anthropologists writing when he proposes how pattern can be used actively as *a mechanism for producing* localized information.

In *Mind and Nature: A Necessary Unity*, Bateson states that,

> Any object, event, or difference in the so-called "outside world" can become a source of information provided that it is incorporated into a circuit with an appropriate network of flexible material in which it can produce changes. In

[15] Gregory Bateson. *Mind and Nature: A Necessary Unity*. (New York: E.P. Dutton, 1979), 16.
[16] Ibid.

> this sense, the solar eclipse, the print of the horse's hoof, the shape of a leaf, the eyespot on a peacock's feather–whatever it may be–can be incorporated into mind if it touches off such trains of consequence. [17]

He follows the above statement by calling attention to the notion that Alfred Korzybski's generalization of 'the map is not the territory,' can be simplified to asserting that 'the effect is not the cause.' Moreover, when effect and cause are incorporated into a system such as a mapping of a territory, a 'premise' of transformation or coding is established. Once such a premise is understood, various relationships between effect and cause can be 'classified.'

In *Steps to an Ecology of Mind*, Bateson explains how it is possible to create a system that uses redundancy as a means of 'localizing' (restricting to a particular place) information.[18] The system is synonymous with the above idea. He begins by noting that because they are determined by contrast, frequency, symmetry, correspondence, conformity, or variables that have zero dimension, information and form can never truly be located. However, in a system containing redundancy, it is possible to begin a 'mapping' of formal relations that can lead to the localization of information.

Bateson begins by proposing the existence of a finite aggregate of events (such as a sequence of letters of a tree) where an observer is aware of all redundancies, those of which are also recognizable (ie. object A is always located next to object B). He explains that this situation makes it possible to determine the boundaries of the regions in which the observer can achieve better than random guessing. In order to localize information, he states that one can strategically cut across these regions with 'slash marks' in order to create a system in which the observer can make educated guesses about what exists on one side of the slash mark, using that which exists on the other.

2.5 Additional Support

Bateson believed that 'Any object, event, or difference in the so-called "outside world" can become a source of information provided that it is incorporated into a circuit with an appropriate network of flexible material in which it can produce changes' (section 2.4). It is evident that Andersen and Soloman agreed that this was true and could

[17] Gregory Bateson. *Mind and Nature: A Necessary Unity*. (New York: E.P. Dutton, 1979), 110.
[18] Gregory Bateson. *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc,1972), 416-417.

be applied to architectural design through their proposition that Bateson's understanding of pattern provides architects with a means for 'linking form and information, matter and thought' in architecture (section 2.1). In addition to these individuals, there are other scholars whose writing provides additional support of the possibility.

Toward a Science of Metapatterns: building upon Bateson's foundation (Tyler Volk, Jefferey W. Bloom, and John Richards)

In an article written with the intent of exploring the ability of a science to be formed using Bateson's proposal that their exists a 'metapattern' or pattern of patterns,' a biology professor, a professor of teaching and learning, and a professor of sociology and philosophy find that 'functional patterns that confer advantages on the systems that possess those patterns can converge in biological, cultural, and cognitive realms.'[19] They find that those convergences are 'common solutions to the same functional problems that span a wide variety of systems,' and principles such as borders, arrows, cycles, centers, and networks are the general components of those systems and Bateson's metascience. Furthermore, the authors conclude that Bateson's view of pattern is a metascience that has implications for research in humanities and social science, as well as other forms of dynamic learning.

Particularly supportive of the applicability of Bateson's work to architecture, is the article's conferring that Bateson's metapattern transcends scale, and could be considered the 'discipline-independent rules of functional forms.' It is found that Bateson's work has the ability to contribute to the quest for a unified body of knowledge as he himself had hoped for.

Providing a System for Deviation: Eisenman and Kwinter

In a 1971 article entitled *Notes on Conceptual Architecture: Towards a Definition*, Peter Eisenman identified that in order for conceptual architecture to be successful, there is need for a logic that enables complex and concise meaning to be produced through form and space. He states that this requires 'some sort of

[19] Tyler Volk, Jeffrey W. Bloom and John Richards, "Towards a science of metapatterns: buiding upon Bateson's foundation," Kybernetes, Vol. 36 ISS:7/8 (2007):1070.

transformational method – where the universals of the conceptual structure are transformed by some device to a surface structure and thus capable of receiving meaning.' [20] Eisenman identified this as the central problem for concept architecture and questioned whether or not such a task was possible.

In a 2003 article entitled *Concepts: The Architecture of Hope, On Difficulty and Innovation*, Sanford Kwinter also discuses the need for a form of universal device in order to execute conceptual architecture successfully. Different than Eisenman, he not only points out the need for such a device but also identifies evidence of its necessity in the conceptualism of architecture through his discussion of the conceptualism of music.

Kwinter begins his article by referencing Bertrand Russell in his statement that 'common sense suffices for common problems, but interesting problems require a more disciplined and vigilant approach.' He also references Henri Berson's argument that 'only the seemingly artificial exertions of philosophy could save us from the false pathways of mental habit. [21] Illustrating these ideas, Kwinter discusses in great depth, Arnold Schonberg's introduction of the atonal system of musical composition in the early 20th century and its opposition to the widely accepted tempered chromatic scale of classical music. This deviation away from the classical way of composition initiated the steps that led to the understanding of music as a vessel through which thoughts and emotion could be expressed (ie. jazz, rock 'n' roll, hip hop, house, etc.). Kwinter describes Schonberg's atonal system of composition as the beginning of the 'conceptualism' of music, and uses it to argue that the use of concepts in art and architecture serve as 'the primary walking sticks with which we navigate new space and reshape ourselves.'

Critical to the support of the applicability of Bateson's ideas to architecture is Kwinter's deeper explanation of how atonality came about. He notes that it began by late 18th and 19th century composers pushing their compositions beyond classical rules of tonality. However, this 'pushing beyond' was nothing but pushing in a blind direction so to speak until Schonberg provided the foundation (atonalism) upon which the systems known as serialism of dodecaphonism could be established. These rigid systems of

[20] Peter Eisenman, "Notes on Conceptual Architecture: Towards a Definition." Casabella no. 359-360, December (1971): 51.
[21] Sanford Kwinter, "Concepts: The Architecture of Hope; On Difficulty and Innovation." *Harvard Design Magazine*, Fall/Winter, 2004.

atonality would lead to thinking of music in terms or rhythmic or periodic relationships. In essence, Schonberg did not introduce deviation from classical music (this was done by late 18th and 19th century composers), but more importantly, he introduced *a system for deviation*. Kiwinter points out that it was not a 'pushing beyond' that enabled the conceptualism of music, but rather a system through which the pushing could occur critically and consistently.

It is arguable that the current state of architecture in its commonly conceptually based approach remains in a position of 'pushing beyond' in a blind direction because it does not have a 'device' (according to Eisenman) or system (Kwinter) by which it can consistently execute concepts. Eisenman identifies the difficulty in forming such a device in architecture because of a building's need to communicate complex and concise meaning with both form and space. Likewise, while Schonberg's atonalism was able to lead to the successful conceptualism of music, music only deals with one realm of perception; architecture deals with many. As Andersen and Soloman pointed out and as shown in chapter 2, Bateson's understanding of pattern can offer architects the platform that Eisenman and Kwinter discuss is necessary for the meaning or conceptualism of architecture.

When analyzing it on its own, it appears that Bateson's 'discipline-independent rules' of pattern (as referred to by Volk, Bloom, and Richards) provides precisely the unique platform that Eisenman and Kwinter discuss, but it is obvious that more of a direct connection needs to made before attempting to implement and establish it as such. Andersen and Soloman describe that Bateson's understanding of pattern offers 'unique benefits' to architectural design in terms of its task to establish multi-dimensional relationships, but **how easily can Bateson's theory of pattern translate to the analysis and process of architectural design? If it can be translated, how complex and concise is the experience of the information it can produce in architecture? To what extent can it be inclusive of both formal and spatial dimensions as Eisenman stated is the main challenge in the clear meaning of conceptually based architecture? Furthermore, how consistently can it be used in this fashion?** These are the specific questions that the remaining sections of written and design research will seek to answer.

Chapter 3. Application in Architectural Design

Opposite to the way pattern is more commonly defined as *that which flows through architecture*, Bateson's writing points to a definition that enables architecture to *flow through pattern*. In its ability to do so, it is arguable that a building can carry and produce and communicate localized information through redundancy or patterning. This is not to say that the functionality of architecture becomes a secondary concern in the process, but on the contrary, its functionality is able to benefit directly from what this project will call the 'mechanism' of pattern. The following sections will explain the application in terms of two parts, which include a definition of its components and a definition of its use. While the two components have been distinguished between for ease of comprehension in this situation, this project argues that in order for Bateson's view of pattern to be translated advantageously to architecture, the two cannot be separated.

3.1 Definition of Components

Based on Bateson, Andersen, and Soloman's writing, the components of pattern as a mechanism in architectural design can be defined as redundancy, coding, and noise. A description of these components in architecture are as follows.

Bateson defined redundancy as the 'patterning or predictability of particular events within a larger aggregate of events.' Therefore, redundancy in architecture can be understood as any aggregate of events that may be perceived as less different or more ordered within themselves in comparison to a larger aggregate of events in which they are a part. Bateson states that in mental processes, perception operates only upon the news of difference, and as long as the perceiving of that difference is not too slight or too slow (ie. requiring a microscope or prolonged period of observation), the means by which we receive it does not matter.[22] Therefore redundancy in architecture may be achieved through physical components such as a structural system, a row of windows or an arrangement of interior spaces, or through non-physical components such as program, natural lighting, or a color pallet. These or any other components of architecture that

[22] Gregory Bateson. *Mind and Nature: A Necessary Unity*. (New York: E.P. Dutton, 1979), 29.

enable difference and order to be controlled, can act as the predictable aggregate of events. Meanwhile the building project in which they are a part can act as the 'larger aggregate of events' that they exist within.

Bateson defined coding as information that is carried by parts present about parts missing in a redundant aggregate of events. He proposed that it is coding that enables predictions to be made about parts missing in a redundant aggregate of events, and it is that ability to predict which is a form of localized information. Therefore, in architecture, coding can be understood as the information carried by architectural components present in a redundant set about components that may be missing. Like the architectural components that may be understood as redundant, those that may be understood as noise can be physical or non-physical.

Finally, Bateson defined noise as 'all that is not information, not redundancy, not form and not restraints,' while Andersen and Soloman identified it as 'the random unexpected, or out-of-system element that is indiscriminately introduced into an otherwise regular field or sequence.' Bateson sees noise not as a completely foreign element, but only as a form of redundancy that has the ability to be coded as part of a redundant aggregate of events. Thus, he believes that localized information can be formed about the relationship between noise and the redundant aggregate of events it is coded as being a part of.

3.2 Use of Components in Design

Difference as Materiality

Based on Bateson's writing, the way to go about using pattern as a mechanism for producing information from architecture begins with an understanding of difference not as a byproduct of materiality, but as materiality itself. The logic in this reasoning can be found in Bateson's explanation that while a piece of chalk has an infinite number of potential differences, only a few become 'effective' differences. In other words, 'information consists of differences that make a difference.' (p.8) If differences in architecture are to be used to make effective differences, it is necessary that the designer establish a premise in which (as much as possible) all differences can be clearly

summated, as is the case of a map of a territory.

In order to establish a premise in which all differences can be summated, components of architecture that create a perception of difference need to either be integrated into the premise, or minimized. In addition to a map of a territory, an example in which such a premise has been established can be observed in the performance of a dance (figure 16). In contrast to architecture, this rigorous way of thinking about difference is inherent in this discipline.

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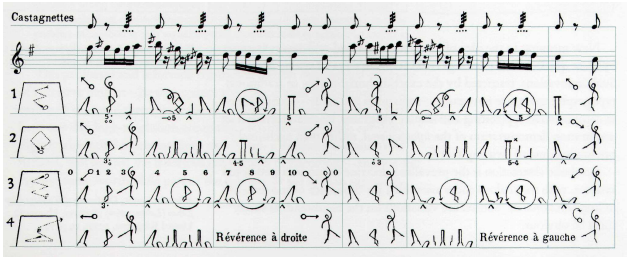

Figure 16. Music and dance as premises in which all differences are 'effective' (A.J. Shaefe, *redrawn extracts from the score Cachucha for the ballerina Fanny Elssler*, 1990, drawing, *Envisioning Information*, by Edward Tufte (Cockeysville, MD: Graphics PR), 117.)

Unlike architecture, all components of a dance performance are consciously part of a premise in which all differences can be clearly summated, or in other words, perceived as differences that make a difference. This condition can be observed primarily in the *absence* of differences that would not make a difference or otherwise distract from summation of those that would, such as extraneous movements, sounds, articles of clothing, etc. There is a careful balance of difference and similarity between part and whole.

Creation of a Coding Premise

Bateson identified the map of a territory as a premise for coding, where in which various cause and effect relationships can be 'classified.' (section 2.4) The *process* of creating a map or *mapping* points towards the way in which a coding premise can be designed into architecture. The following section will describe how the design of a map creates a coding premise, and furthermore, how a coding premise can be designed into architecture.

The first reason a map is able to establish such a premise is that it has been designed around a finite aggregate of events or objects. All differences are 'effective differences' because the map uses only the elements in this aggregate. Moreover, the aggregate itself has been designed to function for the premise of coding. This can be observed within the below map in which all graphic elements that represent a territory are consistent in their graphic style, texture, lack of color, etc., yet each maintains it own individuality. All components follow a 'key.' (figure 17) As is the case in the discipline of dance, there is a balance of difference and similarity between parts. It could be said that while there are many ways of designing a map 'key,' its effectiveness is always dictated by the degree to which this balance can be achieved.

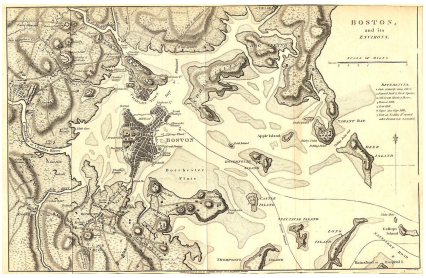

Figure 17. Map designed around a key (P. Phillips, *Boston and Its Environs: Circa 1800*, 1806, 8 in. x 12.5 in., Archiving Early America. Accessed March 27, 2015. http://www.earlyamerica.com/earlyamerica/maps/bostonmap/)

In using only a finite aggregate of components of a 'key,' the designer of the map is then able to communicate various forms of information using only different compositions or arrangements of redundancy, noise and coding. For example, in the below mapping of Earth (figure 18), the information that there is debris around the earth is able to be communicated not only because it works within a finite aggregate of events and objects or 'key' (black and white, lines, and dots) but also because it is highly strategic about how the elements of redundancy, noise and coding are employed within this aggregate. There is redundancy in the presentation of the Earth and debris relationship through three representations. Noise could be considered as occurring through the variation in perspective and scale of each map. Coding occurs through the perception that the debris creates a belt-like formation of around the Earth. Like a piece

of English prose, each representation contains localized information about the other that enables meaning to be derived specifically through redundancy, noise and coding.

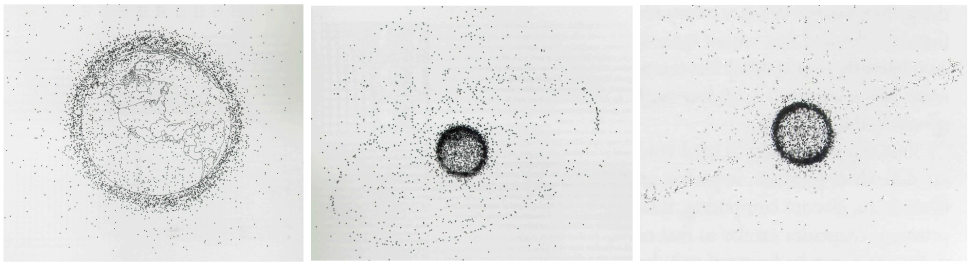

Figure 18. Localized information of a debris belt around earth communicated through the design of a coding premise in mapping (Donald J. Kessler and Burton G. Cour-Palais, *Collision Frequency of Artificial Satellites: The Creation of a Debris Belt*, drawing, black and white print, Teledyne Brown Engineering, Colorado. *Envisioning Information*, by Edward Tufte (Cockeysville, MD: Graphics PR), 48-49.)

The localized aspect of information in the mapping is successfully perceived or *coded* because of the designer's creation of a premise in which it can occur. For example, had their been more variation in the finite aggregate of components comprising map, differences might not have been as easily summated. Had there been another image in the redundant set, or had different perspectives been represented in the images, the information that the mapping is communicating the belt formation of debris may not have been discernable. The components of a finite aggregate, redundancy, noise, and coding are each deployed in a strategic way in respect to each other and the whole.

Cause and Effect Relationships

In the design of architecture, once a premise has been established in which all differences can be summated, the components of redundancy, noise, and coding can be deployed in different ways in order to create various cause and effect relationships or forms of coding. The below example demonstrates a simple example (figure 19). A premise in which differences can be summated has been established in the form of the facade, a predictability of particular events within that premise (redundancy) has been selected in the organization of window types (designated by the different colors), and coding occurs in our ability to guess with better than random success at type of windows missing or not immediately visible to us. In this case, noise could be considered as the unpredictable or randomly occurring window types and organizations (designated by

pink, red, orange colors). The information carried by each window about others adjacent to it and with the whole is functioning to integrate the building through the façade. This is a form of localized information that it is available in our immediate perception of the façade.

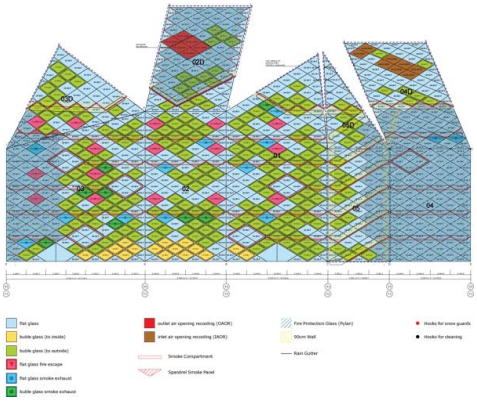

Figure 19. Façade diagram depicting different windows (Herzog and DeMeuron, *Prada Aoyama: unfolded elevation showing different panel uses*, 2003, color diagram, Archnewsnow, Accessed March 27, 2015. <http://www.archnewsnow.com/features/Feature343.htm>)

3.3 Evidence of Functionality in Architectural Design

While the example in figure 19 demonstrates a relatively simple use pattern a means of producing information from architecture, Bateson's writing suggests that the mechanism can be used in much more critical and complex ways in architecture. Bateson suggests this particularly through the range of dimensions in which he employs the mechanism (section 2.2) The following two sections (section 3.3 and 3.4) will exhibit a range of applications within the field of architecture. It is important to note that these applications are meant to show instances in which pattern's ability to produce localized information is evidently *functioning*. It is not being argued that the writers and or architects were consciously thinking to use pattern in this deliberate way. Like the study of phenomenology in architecture, the line between a 'lens' and a 'method' is somewhat ambiguous. Furthermore, the demonstration of a more 'active' or 'procedural' use of pattern as a mechanism in architectural design will take place in forthcoming design research (chapter 6).

'Producing 'Affects''

Mousavi and Kubo discuss the importance that architecture produce 'affects' in

order to connect to culture. They claim that unlike more traditional forms of ornament, affects provide 'indirect analogies that bypass the need for the codification of language,' and 'seem to grow directly from matter itself.'[23]

On several occasions throughout their book, the authors illustrate that it is the use of pattern as a mechanism through which affects are achieved. For example, the below left diagram (figure 20) demonstrates that form, structure, envelope, and the extended lines of a square are able to produce the affect of 'randomness,' while the below right diagram demonstrates that a tile unit, color, structure, and hexagonal geometry are able to produce the affect of 'differentiation.'

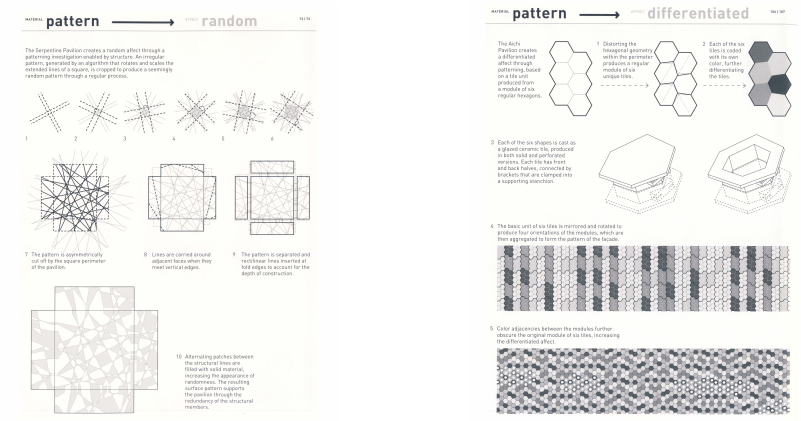

Figure 20. Use of the mechanism of pattern to create 'affects' from architecture (Fashid Moussavi and Michael Kubo, *Serpentine Pavilion* and *Aichi Pavilion*, 2006, black and white drawings, *The Function of Ornament*, by Fashid Moussavi and Michael Kubo (Spain: Actar, 2006), 72, 106.)

In the example on the left redundancy takes the form of the predictable steel structure and envelope system, while noise takes the form of the randomness with which the components of the structure and envelope system are arranged (represented by the lines in the diagram). Thus, coding produces the information that the element of randomness is in fact related to the structure and envelope system.

The example to the right exhibits redundancy as the hexagonal tile unit, it's grouping in arrangements of six, and its mirrored columns, while noise takes the form of the different ways in which the six unit arrangements are colored. Consequently, coding

[23] Fashid Moussavi and Michael Kubo. *The Function of Ornament*. Spain: Actar: Spain, 2006.

creates the information that the element of differentiation is embedded in the redundant arraignments.

It is arguable that the ability of the above affects to provide 'indirect analogies that bypass the need for the codification of language,' and 'seem to grow directly from matter itself' is enabled by system of pattern having been applied to architectural design. The ability to 'bypass the codification of language' is a result of the use of coding of through redundancy in order to communicate. Meanwhile, the perception that the affects are 'emerging from matter itself' is due to the system of pattern being able to operate only upon the news of difference.

'Rhythmic Integration'

A 1953 journal entitled *Rhythmic Integration of Panel Elements* discusses the ability of pattern to be used in order to manage components of architecture in a systematic and integrated way, while at the same time, produce effects in order to 'produce physical and emotional effects in the user' and lead users 'along certain lines in space.'[24] Through their verbal discussion and graphics, the authors show it is the mechanism of pattern that is functioning to achieve these tasks.

In the cases presented in diagrams, redundancy is achieved through the arrangement of panels in a way that enables one to guess with better than random success as to how the sequence will unfold over time. The different wall, ceiling, jalousie, and floor components (noise) that are introduced to the assembly can become easily integrated (coded) as part of the system. For example, in the assembly on the left, the positions occupied by the jalousies could be replaced with a different type of jalousie and so long as they maintain the expression of difference from the other wall panel type, the identity of the arrangement could be maintained.

[24] Pietro Belluschi, Harwell Hamilton Harris and Phillip Johnson, "Rhythmic Integration of Panel Elements," *Perspecta*. Vol. 2 (1953): 38.

Figure 21. Wall panel assemblies (Pietro Belluschi, Harwell Hamilton Harris and Phillip Johnson, *wall panel assemblies*, 1953, black and white diagrams, "Rhythmic Integration of Panel Elements," *Perspecta*. Vol. 2 (1953): 39, 42.)

The examples exhibit application of pattern as a mechanism in architecture in that shows somewhat rigorous thought about how above all else, the element of predictability can be exploited to produce localized information. This is evident in both the graphic diagrams the discussion of how the components in the assembly were customized to function within the system. For example, statements throughout the journal such as the one below:

> "The most common width of economical panels is 4 ft. This is too wide for a door…at least and interior door. If it is decided to keep a narrower unit–say 3 ft.–it is necessary to trim 1 ft. off each panel." (p.40)

'Atmospheric Conditions'

In a text entitled *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* Kengo Kuma demonstrates the mechanism of pattern being used to create atmospheric conditions. This can be seen in the below examples (figure 22) taken from a set of 'case studies' described by Kuma as being driven by a 'particle.'

Figure 22. Pages taken from *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (*Nail Puller Thousand Power* and *Clouds*, 2012, digital renderings and diagrams, *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture*, by Kengo Kuma et al (Berlin: Gestalten, 2012), 24-25, 42-43.)

While Kuma's application of pattern involves many uses of pattern including mimicry and motif, his creation of whole 'atmosphere's in which structure, façade, interiors, etc. could be considered as driven by the mechanism of pattern. 'Atmospheres' such as the ones depicted above are able to perceived or coded through redundancy of a 'particle' throughout structure, envelope, and interior elements.

Chapter 4. Case Studies: Critical Applications

4.1 Phenomenal Transparency: Zollverein School of Management, SANAA

The Zollverein School of Management (SANAA) is a 35 meters by 35 meters by 35 meters concrete cube located in Essen, Germany. The school is located on historical site of an old coal-mining factory, and is adjacent to a residential suburb. Construction of the school was completed 2010.

The building contains five floors of different heights, including a terrace located on the top level. Programs include an auditorium, studios, offices, classrooms, library, and conference rooms. The interior spaces, circulation cores, and voids in the roof and fourth floor adhere strictly to a square grid. In addition, the 134 windows and building entrances are in the shape of a square. Because the architects wanted to keep the thickness of the walls to a minimum, the building uses an active thermal insulation system that consists of a network of radiant tubes running through its walls and floors. The system uses heat energy from the nearby coal mine.

As is the case with most of SANAA's work, the project focuses obtaining a quality of spatial transparency. While the architects do not speak in depth about their design methods, it has been examined by Eve Blau that the architects' methods are heavily grounded in obtaining qualities of visual and phenomenal transparency.[25]

Figure 23. Zollverein School of Management, SANAA (Iwan Baan, *Zollverein School of Management and Design*, 2010, digital images, Archdaily. Accessed March 27, 2015. <http://www.archdaily.com/54212/zollverein-school-of-management-and-design-sanaa/>)

[25] Eve Blau, "Tensions in Transparency," *Harvard Design Magazine*, Fall/Winter 2009/09.

In *Transparency: Literal and Phenomenal*, Colin Rowe and Robert Slutzky define there to be two types of transparency in architecture–literal and phenomenal.[26] The authors explain that literal transparency is the equivalent of physical translucency–such as a glass curtain wall, while phenomenal transparency is a concept borrowed from theorist Gyorgy Kepes, which can be understood through his definition written in *Language of Vision*:

> If one sees two or more figures overlapping one another, and each of them claims for itself the common overlapped part, then one is confronted with a contradiction of spatial dimensions. To resolve this contradiction one must assume the presence of a new optical quality. The figures are endowed with transparency; that is they are able to interpenetrate without an optical destruction of each other. Transparency however implies more than an optical characteristic, it implies a broader spatial order. Transparency means a simultaneous perception of different spatial locations. Space not only recedes but fluctuates in a continuous activity. The position of the transparent figures has equivocal meaning as one sees each figure as the closer or as the further one. (p.160)

Based on Kepes' above definition, it is explained that instead of visual clarity, phenomenal transparency can be understood as a state of being 'clearly ambiguous.' Furthermore, literal transparency is induced by substance, while phenomenal transparency is a product of organization.

Rowe and Slutzky then use a series of paintings to express both phenomenal and literal transparency independent of each other, and phenomenal mixed with literal. Two Cubist paintings by Braque and Gris, and a post-Cubist painting by Leger are used to express phenomenal transparency independent of literal.

The Portuguese (Braque), *Still Life* (Gris), and *Three Faces* (Leger) are used to demonstrate phenomenal with the absence of literal transparency. A number of varying strategies are employed, but all more or less with the overall goal of creating a clarity of ambiguity. *The Portuguese* uses 'interlacing of horizontal and vertical gridding creating a shallow and flattened space.' [27] *Still Life* uses a 'system of weaving oblique and curved

[26] Colin Rowe and Robert Slutzky. "Transparency: Literal and Phenomenal." *Perspecta* Vol. 13/14 (1971): 160.
[27] Ibid., p. 163.

lines in a shallow space and varied but definite light sources.' [28] Three Faces uses an 'alignment of pictorial objects at right angles to each other and to the edges of the picture plane,' 'flat opaque coloring,' 'setting up a figure ground reading through compressed disposition of highly contrasted surfaces,' and 'use an almost two-dimensional scheme to achieve a maximum clarity of positive and negative forms.' [29]

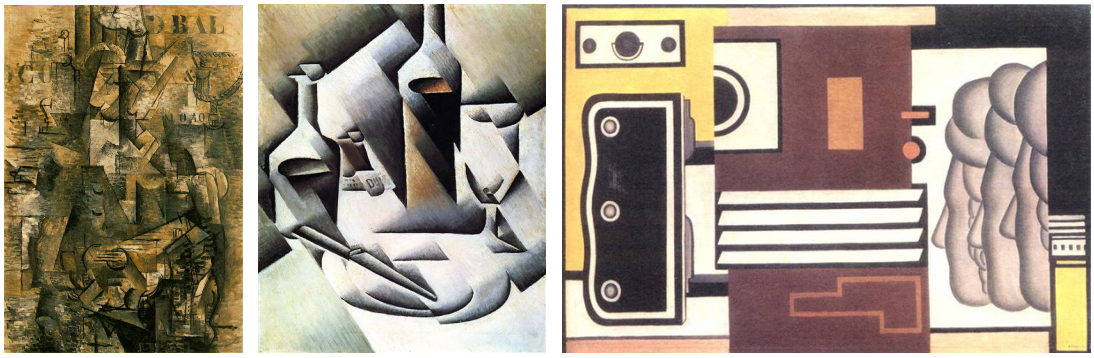

Figure 24. (above-left). Georges Braque, *The Portuguese*, 1911. oil on canvas, 116 cm x 81 cm. Basel, Switzerland, Kunstmuseum. "Transparency: Literal and Phenomenal." Perspecta Vol. 13/14 (1971): 178, Plate 60.

Figure 25. (above-middle). Juan Gris, *Still Life*, 1912, oil on canvas, 55 cm x 46 cm. Otterlo, Netherlands, Rijksmuseum Kroller-Muller. "Transparency: Literal and Phenomenal." Perspecta Vol. 13/14 (1971): 179, Plate 62.

Figure 26. (above-right). Fernand Leger, *Three Faces*, 1926, gouache and brush and India ink on paper, 26 cm x 38 cm. New York, private collection. "Transparency: Literal and Phenomenal." Perspecta Vol. 13/14 (1971): 180, Plate 64.

It could be said that that the mechanism of pattern enables the school to achieve a phenomenal transparency in a highly objective way. In this situation, the component of redundancy could be seen as the square and cubic geometry and the component of noise could be seen as the architectural components that are subsumed in that geometry including building form, structure, fenestration, egress, interior spaces, etc. (figure 27)

The process of coding occurs in the user's perception that the all architectural components assume the same geometric form of a square or cube (figure 28). The components and consequently, the spatial organization as a whole, are coded as lacking depth, and therefore ambiguous. Within a finite set of events or objects, multiple

[28] Colin Rowe and Robert Slutzky. "Transparency: Literal and Phenomenal." *Perspecta* Vol. 13/14 (1971): 164.
[29] Ibid., p. 165.

languages of description produce incremental knowledge without the introduction of objective information. The mechanism of pattern created a system in which each architectural component could be described or coded as ambiguous in numerous ways within the finite set of square and cubic geometry, thus producing incremental knowledge of the overlapping spatial condition as the building is experienced over space and time.

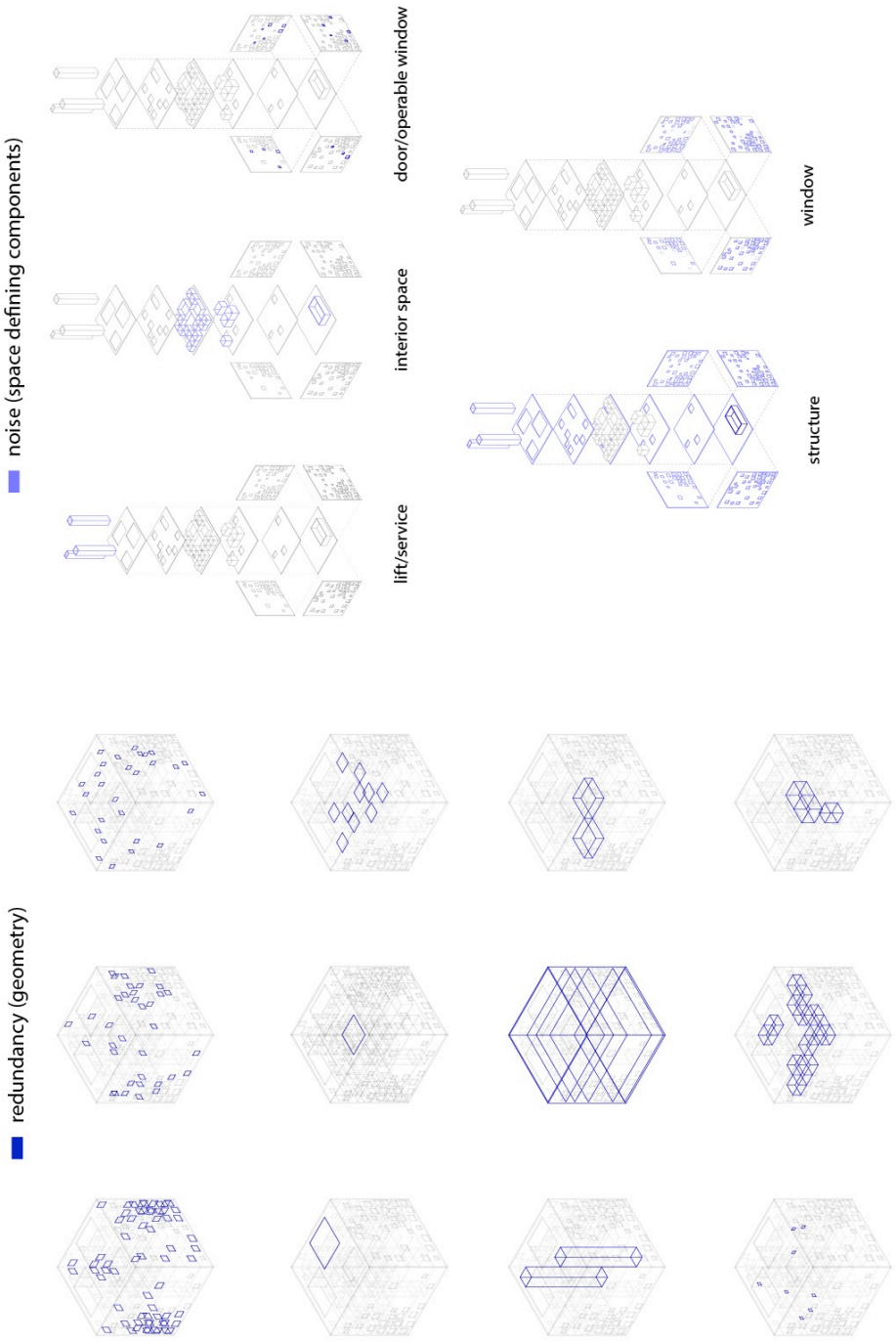

Figure 27. Redundancy and Noise Analysis (Zollverein School of Management)

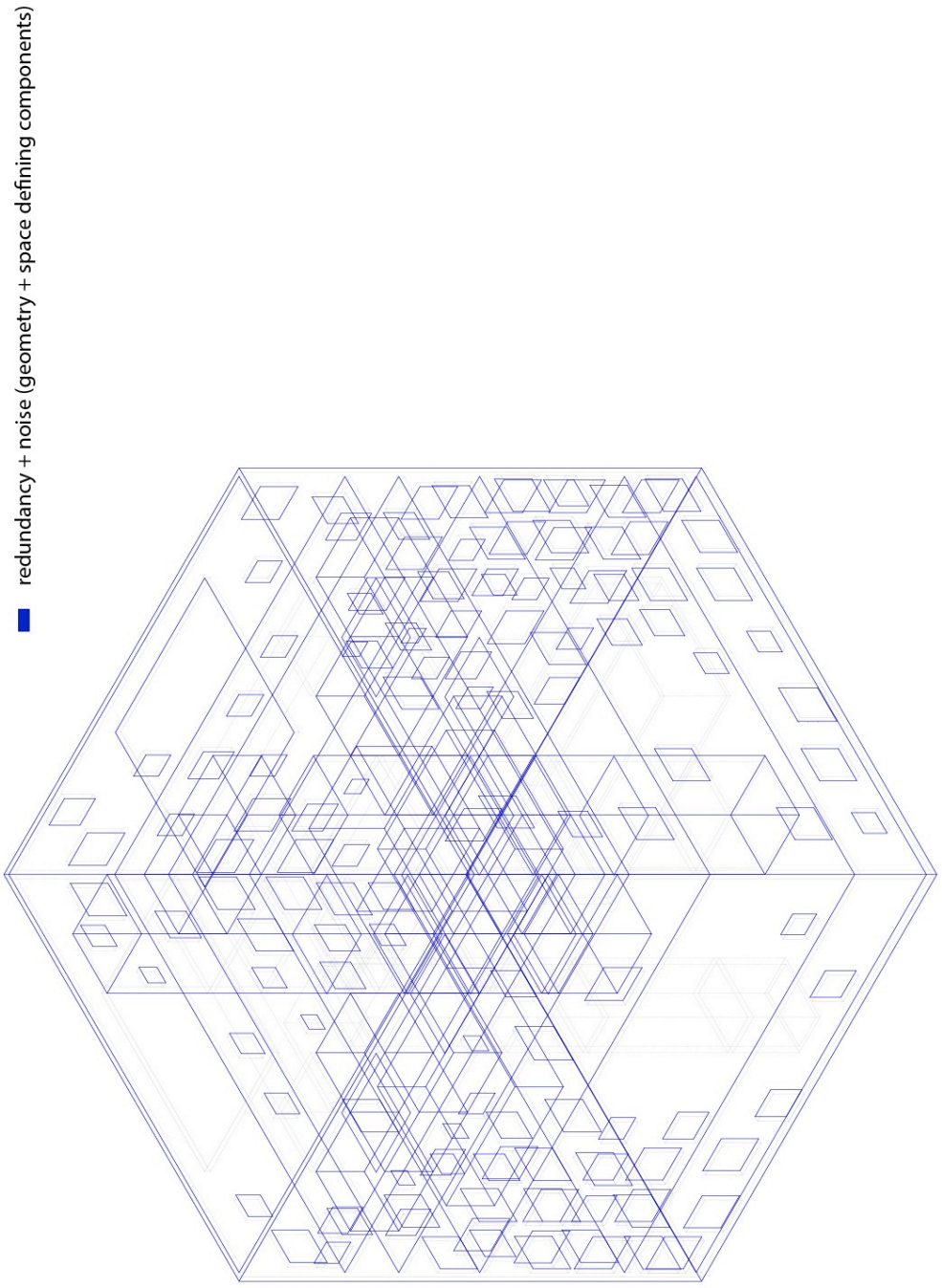

Figure 28. Coding Analysis (Zollverein School of Management)

Through the example of cubic paintings, Rowe and Slutzky define that phenomenal transparency is the perception of their being a clarity of ambiguity. In the design of the school, information of a clarity in spatial ambiguity is achieved by the ability of the mechanism of pattern to enable a positive and clear coding of the majority of architectural components as part of the finite geometric set.

4.2 Unification of Context: Pratt School of Architecture (Steven Holl)

The Higgins Hall insertion (Steven Holl) in Brooklyn, New York is a 22,500 square foot infill project that sits between two existing brick buildings that were constructed in 1850 and 1864. As a new wing for an architecture school, the building contains architecture studios, an auditorium, a gallery, a digital resource center, and other supporting spaces.

The school has four stories with each floor being a split-level. Locations of these levels are derived by extending the floor planes of the adjacent 19th century buildings that flank it. Joining the staggered levels are ramps running perpendicular to the building's facades. This ramped area functions as an atrium space in which natural light can enter the building.

In addition to being celebrated through the ramped circulation and atrium, the intersection of the misaligned sets of floor planes is expressed in the building's exterior. A network of frames integrating windows and the main entrance of the building incorporates lines created from the locations of the staggered floors as well visual 'beats' or 'accents' created by the rhythm of windows from the adjacent buildings. These frames, which are required to span the gap in the interior floor plates, do so using the composition that Holl composed. In *Color Light and Time*, the architect is quoted below in his description of design concept of the project:

> The building's interior spatial experience registers an idea originating in time difference. As an index of three different times, 1850 and 1864 are joined with 2000 in a sectional shift revealed in the exterior material and geometry. [30]

[30] Steven Holl. *Color Light Time*. (Switzerland: Lars Muller Publishers, 2011), 124.

Figure 29. Pratt School of Architecture, Steven Holl (Michele Nastasi, *Pratt Institute – Higgins Hall Insertion*, 2010, digital images, Divisare by Europaconcorsi. Accessed March 27, 2015. <http://divisare.com/projects/121023-Steven-Holl-Architects-Pratt-Institute-Higgins-Hall-Insertion>)

It is evident that the mechanism of pattern enables the design of the architecture school to be perceived objectively as a unification of its adjacent buildings, and thus as an 'index of three different time' as was intended by Holl. In this the case of this projects, the component of redundancy could be seen as façades and floor plate locations of the adjacent buildings and the component of noise could be seen as the split level floor plates and façade composition of the infill project itself (figure 30).

The process of coding happens in the users perception of the spatial organization and façade of the infill project as a visual and spatial unification of its context. Because of the fact that within a finite set of events or objects, multiple languages of description produce incremental knowledge without the introduction of objective information, the building produces information of its own identity as an object that is the unification of its context. The centralized vertical circulatory space that directly joins the staggered floor plates extending from the contexts and the façade composition that has embedded within it multiple variations of visual linkage between the contexts, both produce multiple languages of description about the identity of the infill as a formal and spatial unification of the adjacent buildings. Exhibited in figure 31 is the fact that the building does so completely through the redundancies already present in its context.

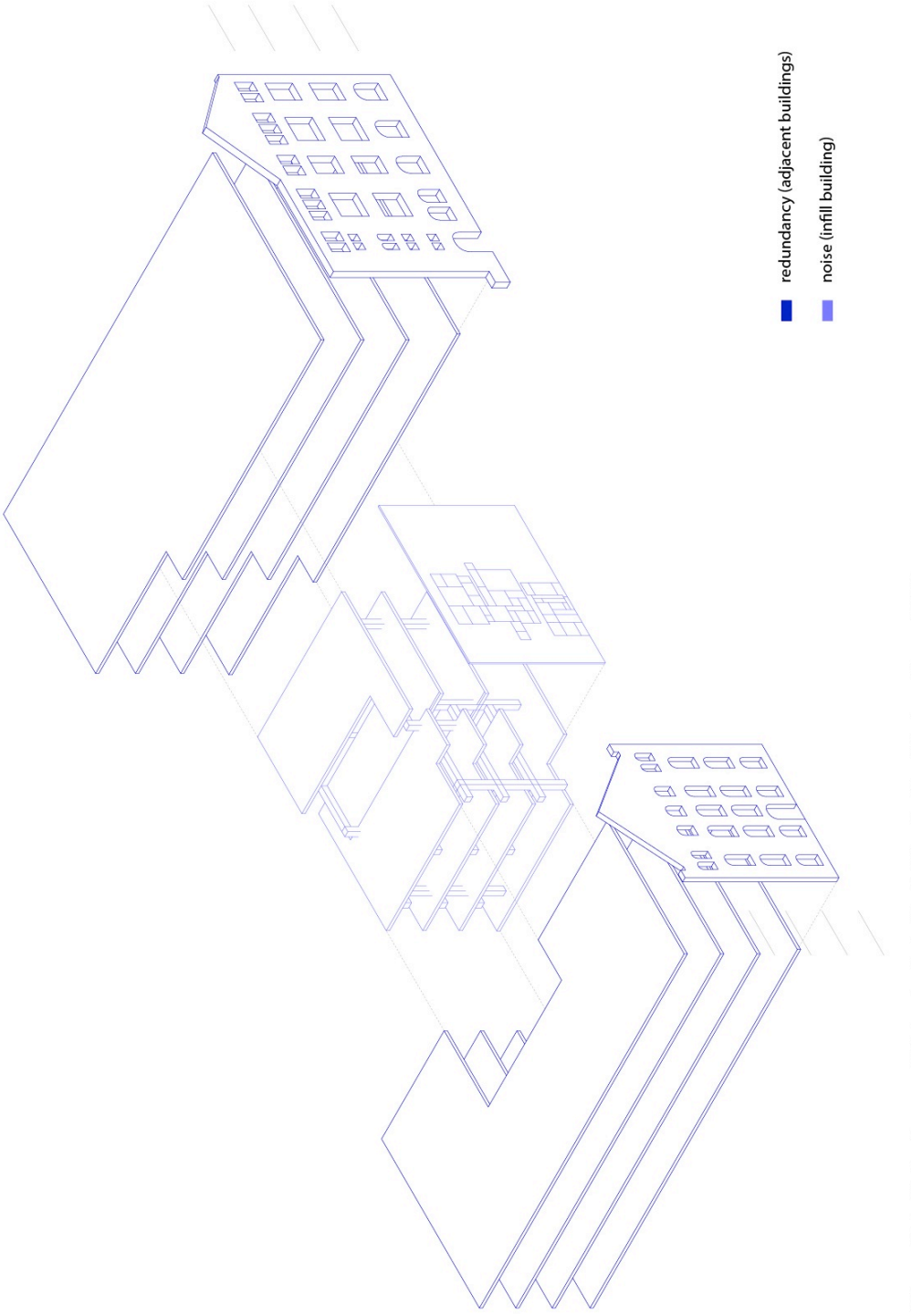

Figure 30. Redundancy and Noise Analysis (Pratt School of Architecture)

Figure 31. Coding Analysis (Pratt School of Architecture)

Beyond providing a means by which the building can produce information of its identity as a unification of its context, it is arguable the mechanism of pattern also offers the design the ability to communicate a highly tectonic quality as Frampton describes it. In *Towards a Critical Regionalism: Six Points for an Architecture of Resistance* Frampton quotes Stanford Anderson in his statement that:

> "Tektonik" referred not just to the activity of making the materially requisite construction…but rather to the activity that raises this construction to an art form….The functionally adequate form must be adapted as to give expression to its function. [31]

Because the floor plates and column and beam structure serve as physical bridging of the structures of the adjacent buildings, and composition of the building's façade is a tectonic extension of those elements, the redundant piece serves as a mechanism in its own right for expressing the structural function of the project.

4.3 Multisensory Experience: Therme Vals (Peter Zumthor)

The Therme Vals (Peter Zumthor) is a 1750 square meter spa that was constructed in 1996 on the site of a natural thermal spring in Graubunden Caton, Switzerland. The building is constructed compositely of in situ concrete walls clad in thin slabs of the local gneiss stone. Programs in the spa include hot and cold bathing rooms, a large indoor and outdoor pool, changing rooms, massage rooms, locker rooms, and service spaces. The only entrance to the complex is through a nearby hotel via an underground corridor.

The spatial organization of the spa is driven by an arrangement of large stone volumes that compose the interior spaces. Cantilevered off each volume are monolithic stone tablets that are arranged to allow two types of natural light to enter the space. Users circulate through the spa by navigating the void space between the volumes, while within them, are more private programmatic elements such as bathing rooms, locker rooms, changing rooms, etc. There is no major circulation channels designed into the complex, other than the user's 'meandering' freely throughout the volumes.

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[31] Kenneth Frampton. "Towards a Critical Regionalism: Six Points for an Architecture of Resistance." In *The Anti-Aesthetic: Essays on Postmodern Culture*, ed. Hal Foster (New York: The New Press, 2002), 16.

According to Zumthor in *Therme Vals*, the initial inspiration behind the design of the Thermal Baths was its immediate surroundings.[32] This consisted of a series of underground tunnels and galleries, a dam, as well as the local gneiss stone. Furthermore, a consistency in all of Zumthor's work is the deliberate intention to achieve a highly phenomenological quality.

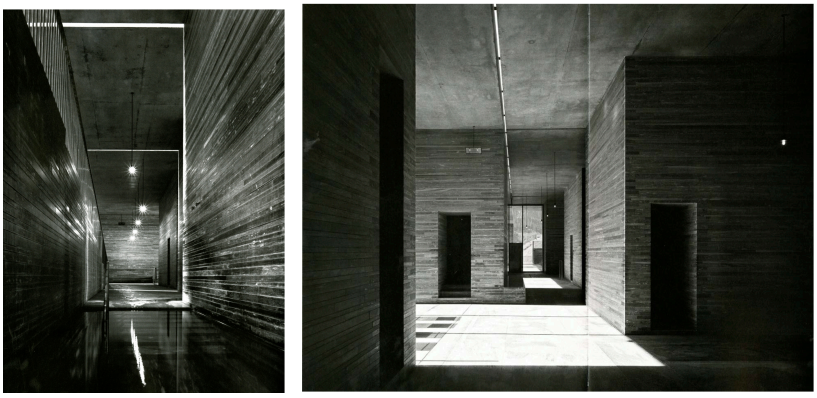

Figure 32. Interiors of Therme Vals, Peter Zumthor (Helene Binet, *Sweat Stone* and *Dam*, 2007, black and white photographs, *Peter Zumthor Therme Vals*, by Sigrid Hauser and Peter Zumthor (Switzerland: Verlag ans Spiess, 2007), 148, 152.)

It could be said that that the mechanism of pattern enables the bath spa to engage multiple realms of perception of the user. Within the design of the building, the component of redundancy could be seen as the individual pairings of stone volumes and cantilevered roof tablets, while component of noise takes the form of the natural light that is introduced through voids left between the roof tablets (figure 33).

The process of coding occurs in users perception of variation of natural light as a direct effect of the varying arrangements of the stone volumes and cantilevered roof tablets with resect to themselves and those they are adjacent to. Within a finite set of events or objects, multiple languages of description produce incremental knowledge without the introduction of objective information. Therefore, the varying ways in which the light interacts with the stone volume-tablet combinations produces incremental perception of information about the close relationship that exists between the structure of the building and the local light. In figure 34, it can be observed that there are two types of light that interact with each stone volume-tablet pairing which include a wall washing

[32] Sigrid Hauser. *Peter Zumthor Therme Vals*. (Switzerland: Verlag ans Spiess, 2007), 19.

light and skylight. Where the edge of a tablet is left flush with the edge of its volume, light washes the wall at the edge. Where edges of a tablet are not flush with the edge of its volume, light takes the form of a skylight. Thus, there is a direct interaction between structure, light, and shadow that is defined in a unique way in each stone volume-tablet instance.

The mechanism of pattern is also employed in the design of the stone cladding in the building. In this case, redundancy could be assumed as the form of the stratification of stone tiles that clad both the interior and exterior of the building, while noise could be seen as the height of a human step, which was the dimension on which the stratification was based. Shown in the figure 35 is the fact that various organizations of three modules of 31, 47, and 63 millimeters were used because they add up the 15 centimeters, or the height of the human step.

A process of coding could be seen as taking place in the user's perception of a human scale embedded in the stratification of the cladding. Because multiple languages of description in a finite set of events or objects produce incremental knowledge without the introduction of objective information, the various combinations of the 31, 47 and 63 millimeter modules create numerous instances of informing the user of the integration of a human dimension in the physical composition of the project.

Figure 33. Redundancy and Noise Analysis (Therme Vals)

Figure 34. Coding Analysis (Therme Vals)

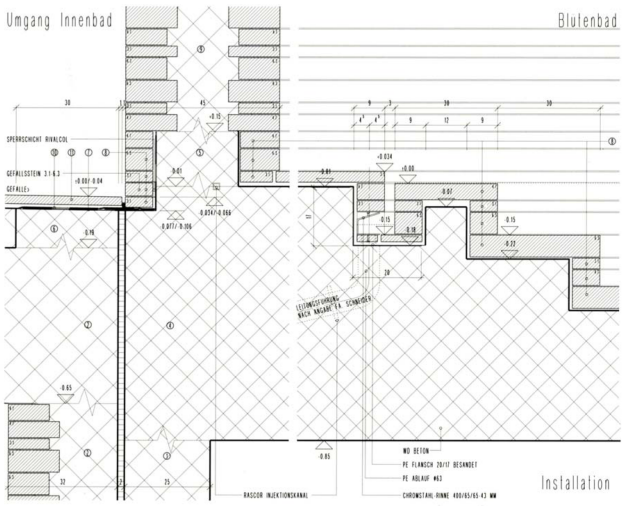

Figure 35. Construction detail of 31, 47, and 63mm stone cladding module based on the 15cm height of the human step (Peter Zumthor, *The stone bond*, 2007, CAD drawing, *Peter Zumthor Therme Vals*, by Sigrid Hauser and Peter Zumthor (Switzerland: Verlag ans Spiess, 2007), 103.)

The project showcases the ability the mechanism of pattern to give a building a precise and almost quantifiable phenomenological quality. In *The Eyes of The Skin*, Juhani Pallasmaa quotes Gaston Bachelard in order to explain the idea of a 'multisensory experience' in creating architecture that engages the senses:

> A walk through a forest in invigorating and healing due to the constant interaction of all sense modalities; Bachelard speaks of 'the polyphony of the senses.' The eye collaborates with the body and the other senses. One's sense of reality is strengthened and articulated by this constant interaction. [33]

The ability of the mechanism of pattern to manage multiple types of light entering a building from a variety of positions with respect to the structure is similar to the experience of walking through a forest or listening to music. The two latter experiences are identifiable by their structured occurrence over time. In walking through a forest, the ability of light to penetrate the trees is determined by the canopy. Light is highly filtered towards the center of a canopy while allowed to penetrate increasingly as it approaches its edges. Because trees require a certain mount of space between to catch light and spread their roots, they grow in relatively regular intervals. Therefore, the interaction

[33] Juhani Pallasmaa. *Eyes of the Skin* (London, UK: Wiley: 2012), 44.

between light, trees, and the body walking through a forest, is one that is somewhat random yet paced strictly according to the regular growth of trees. It could be said that this semi-structured perception of various types of light in a forest is how we distinguish such an experience from other similar ones. The same experience occurs in music which itself is structured on the redundancy of the beat. Notes, rests, changes in pitch and speed all occur with respect to the perception of the beat.

In *Questions of Perception: Phenomenology of Architecture*, Juahani Pallasmaa, Steven Holl, and Albert Perez-Gomez identify 'zones' in architecture that correspond to perceptual phenomena such as touch, smell, taste, sight, etc. The zones they identify are 'Enmeshed Experience: The Merging of Object and Field,' 'Perspectival Space: Incomplete Perception,' 'Of Color,' 'Of Light and Shadow,' 'Spatiality of Night,' 'Time Duration and Perception,' 'Water: A Phenomenal Lens,' 'Of Sound,' 'Detail: The Haptic Realm, Proportion,' 'Scale,' and 'Perception, and Site Circumstance and Idea.' [34]

Not only does the movement of phenomenology in architecture suggest that architects design with a high awareness of how realms of perception operate in relationship to architecture individually, but it also stresses the importance that a building is all-inclusive and orchestrating of the elements. Within a chapter entitled 'Site Circumstance and Idea,' the authors of *Questions of Perception* state that,

> Each challenge in architecture is unique; each has a particular site and circumstance or program; and for each, to fuse site, circumstance, and a multiplicity of phenomena, an organizing idea…a driving concept…is required. The unity of the whole emerges from the thread that runs through the variety of parts; whether it be one discrete idea or the interrelation of several concepts. [35]

The ability of redundancy noise, and coding to organize elements of architecture with respect tot the above 'phenomenal zones' is unique in that it functions both as a means of perceiving time and duration as well as a framework through which the other realms of perception can be engaged in relationship to time and duration. Philosopher Henri Bergsen wrote of duration as a 'multiplicity of secession, fusion, and

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[34] Steven Holl, Juhani Pallasmaa, and Alberto Perez-Gomez. *Questions of Perception: Phenomenology of Architecture* (San Francisco: William Stout Publishers, 2007), 44-119.
[35] Ibid., p. 119.

organization.'[36] The experience of a pattern in any situation is arguably one that involves a momentary withdrawal or 'secession' from reality, a fusing of perception in respect to its redundancy, and a subsequent re-organization of our perception in response to the experience.

4.4 'Particlization': Nasu Ashino Stone Museum (Kengo Kuma)

The Nasu Ashino Stone Museum in Nasu, Japan (Kengo Kuma) is a small museum that was built on the site of three existing storehouses for rice that were built circa 1925-1988. Including the storehouses, many buildings in the surrounding residential neighborhood are constructed of a local stone of grey andesite. The museum itself was designed as an extension to the storehouses and consists of a series of exhibition spaces and outdoor fences that would be placed around and between the existing structures.

The fences are built from horizontal brick louvers cut from the local andesite stone, and mounted to vertical posts. Walls are constructed from the local stone as well as a semi-translucent marble, organized to create voids between them. Each wall is constructed following a slightly different pattern, all of which are generally porous and based off of the same masonry unit. In the case of the fences the dimensions of the louvers was determined by the smallest dimensions in which the stone could be cut and still maintain its necessary structural integrity. [37]

Kuma's design concepts and methods are driven by his desire to 'particalize' architecture.[38] Some other terms that he has used to explain the notion include the 'erasing' of architecture and the 'anti-object.'

[36] Steven Holl, Juhani Pallasmaa, and Alberto Perez-Gomez. *Questions of Perception: Phenomenology of Architecture* (San Francisco: William Stout Publishers, 2007), 74.
[37] Kengo Kuma. *Anti-Object* (London: AA Publications, 2008), 117.
[38] Ibid., p. i-3.

Figure 36. Nasu Ashino Stone Museum, Kengo Kuma (T. Hata, *Stone Museum*, 2005, color photos, Shokokusha Pub. Co., Tokyo. *Kengo Kuma: Selected Works*, by Botand Bognar (New York, Princeton Architectural Press,

It could be deduced that that the mechanism of pattern enables the masonry structures to communicate information of a dissolving, or 'particlization' of a building (figure 36). In this situation, redundancy could be seen as the pattern formed by the joints of the masonry structure, while noise can be understood as the semi-translucent marble and void spaces that are incorporated into the structure (figure 37).

A process of coding takes place in the user perception of semi-translucent marble and void spaces as dematerialized versions of the stone units they take the place of (figure 38). This is the opposite of viewing the marble and void as components that have been added to the structure. The effect is facilitated by the fact that multiple languages of description in a finite set of events or objects produce incremental knowledge without the introduction of objective information. Because the masonry units have been cut to the smallest dimension that is structurally possible, the wall maximizes amount of void space and marble plates it can contain without failing, and the void spaces and marble plates are distributed in a relatively democratic way throughout the walls; the design of the walls maximize the amount of descriptions about it being composed of 'particles.' Furthermore, all variations of the description are facilitated by parts that are taken from a finite set of equally dimensioned stone, marble and void. Shown in figure 36 is the fact that all buildings in the museum have slight variations of a pattern that uses the same finite set of materials, therefore they equate to even more information of the dematerialization of the project as a whole.

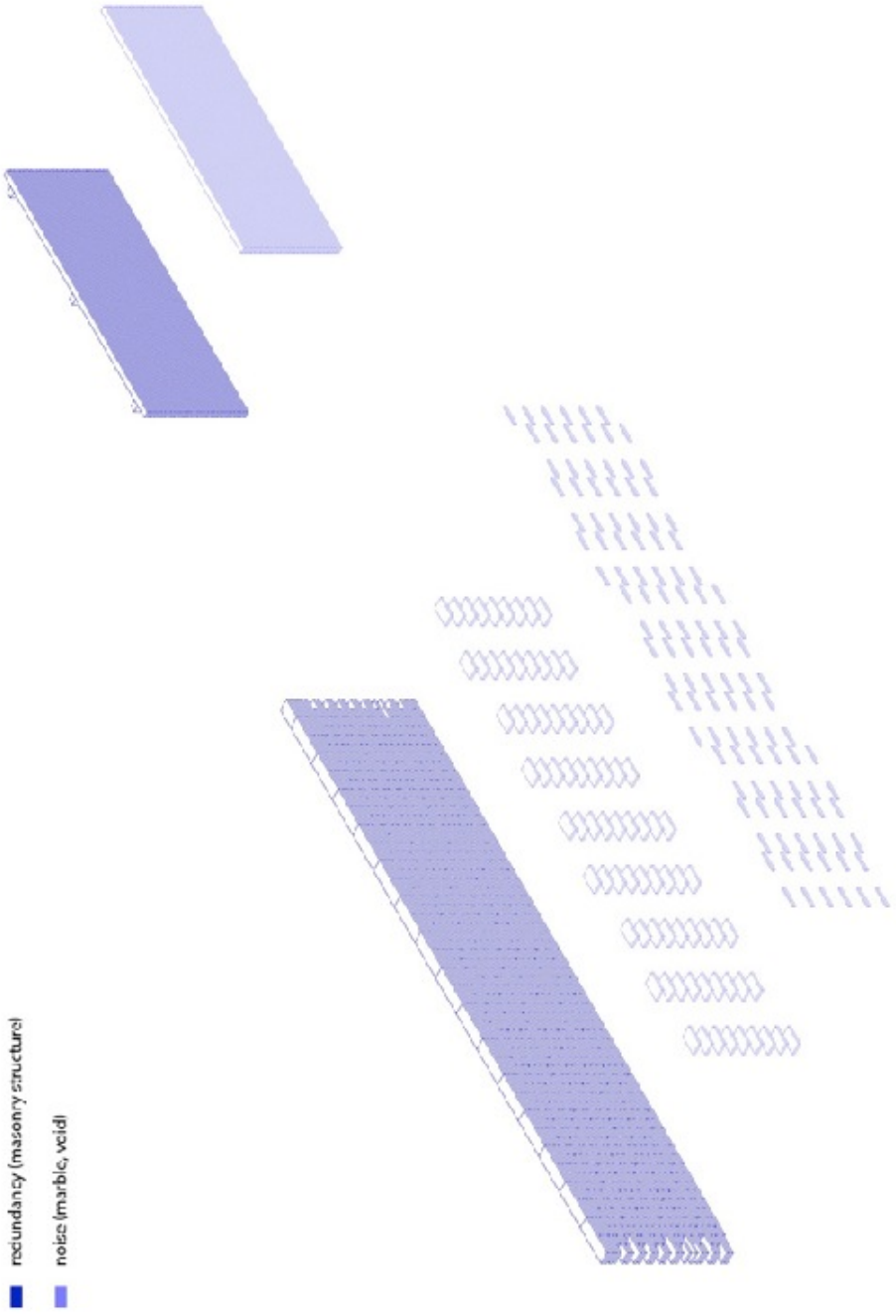

Figure 37. Redundancy and Noise Analysis (Nasu Ashino Stone Museum)

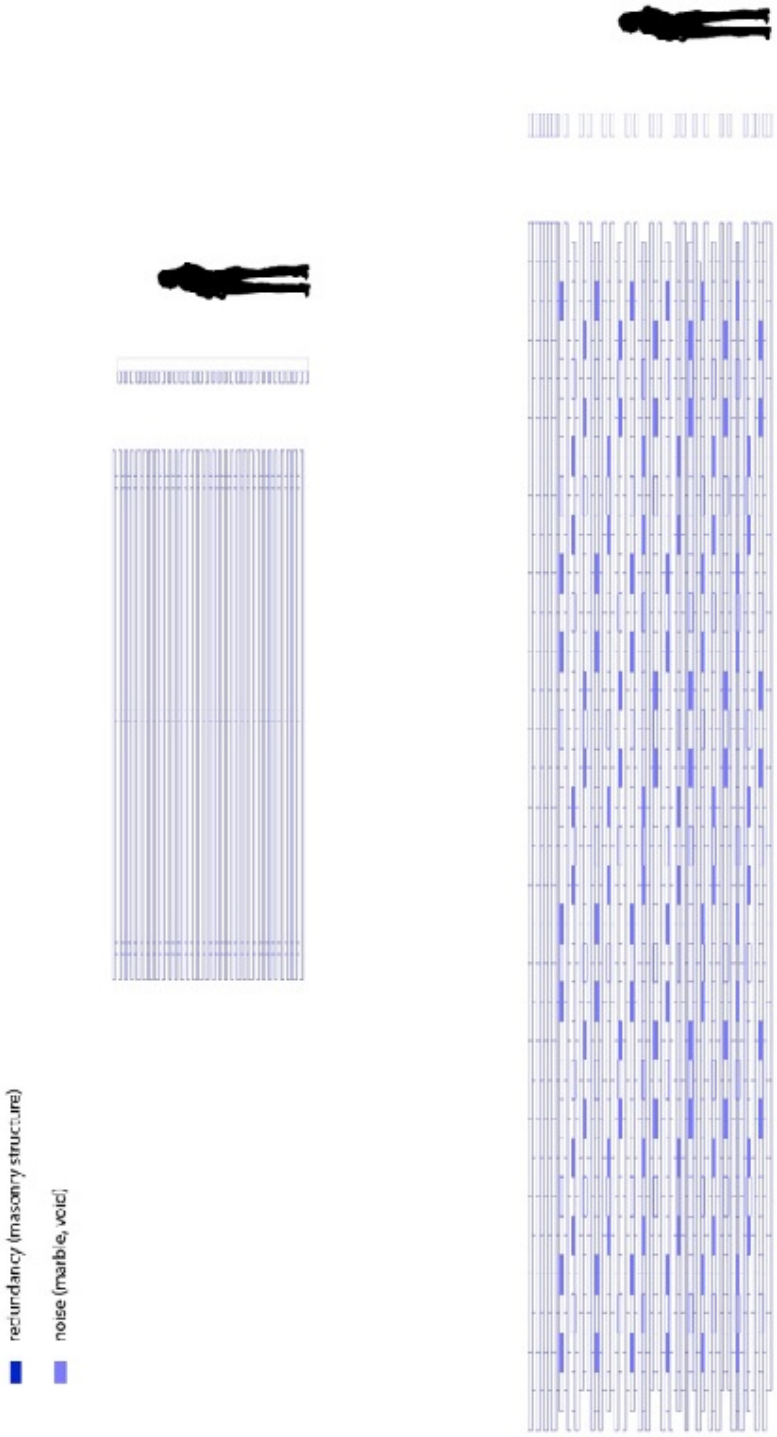

Figure 38. Coding Analysis (Nasu Ashino Stone Museum)

4.5 Landscape Lens: Mary Miss

Field Rotation (Illinois), South Cove (New York), and Battery Park Landfill (New York) are three landscape projects designed by Mary Miss during the land art movement of the 1970's and 1980's. In most cases, the movement produced projects that focused on creating an awareness of one's body in the landscape through physical engagement and interaction, or 'systems aesthetics' (Jack Burnham). Through the application of systems aesthetics, which was a concept that originated in the art world (also referred to as 'systems art'), the works revealed something about the natural setting to the user using 'fieldlike' interventions in the landscape. Elizabeth K. Meyer refers to the designs of the movement collectively as 'focusing lenses for knowing the natural world.'[39] The following project descriptions by Mary Miss are taken from *On Redefinition of Public Sculpture* [40] and the artist's website.[41]

Field Rotation consists of a centralized mound and tower with and field of posts extending out radially from the project's center. These elements are placed within a large open prairie field with a sloping topography. The posts are cut on a perfectly level plane with the top of the mound that also contrasts with the subtlety sloping topography. When approached from the right perspective, the elements of the work collectively reveal the slope of the topography. Within the center of the mound is a sunken pavilion.

Battery Park Landfill incorporates a series of wooden fences all aligned perpendicular to a straight line, and positioned in 50-foot distances from each other. A circular hole is cut out of each fence, each time positioned incrementally lower from the last relative to one side of the sequence. When the installation is viewed from one side, it is perceived that the circular voids are created by an imaginary column tunneling into the ground.

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[39] Elizabeth K. Meyer. "The Post-Earth Day Conundrum: Translating Environmental Values into Landscape Design." In Environmentalism in Landscape Architecture (Washington, D.C.: Dumbarton Oaks, 2000), 191.
[40] Mary Miss. "On a Redefinition of Public Sculpture." *Perspecta*, Vol. 21 (1984): 52-69.
[41] Mary Miss. "Mary Miss," Last modified 2010, http://www.marymiss.com/index_.html.

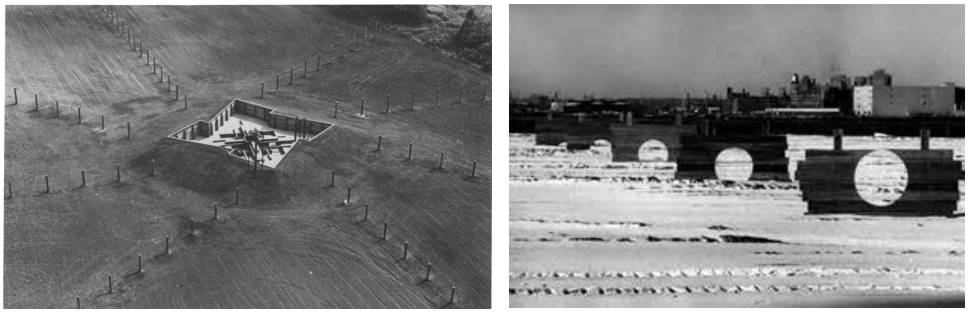

Figure 39. Field Rotation and, Mary Miss (Mary Miss, *Field Rotation*, 1980-1981, black and white photo, *Mary Miss*. Accessed March 27, 2015. < http://www.marymiss.com/index_.html>)

Figure 40. Battery Park Landfill, Mary Miss (Mary Miss, *Battery Park Landfill*, 1973, black and white photo, *Mary Miss*. Accessed March 27, 2015. < http://www.marymiss.com/index_.html>)

It could be said that that the mechanism of pattern enables the projects to reveal information about topographies of the landscapes. In both projects, redundancy can be viewed as the wooden fence and posts, while noise could be assumed as the topographies in which they are placed (figure 39 and 40).

In both cases the process of coding takes place in the users perception of contrast between the wooden fences and posts and the topography of the landscape (figure 41). In this sense, the topographies could be said to be coded negatively in relationship to redundancy of the fences and posts. Because multiple languages of description in a finite set of events or objects produce incremental knowledge without the introduction of objective information, each instance in which the topographies contrasted with the redundancy in the intervention produced information about the topography and the landscape as a whole. Both projects used contrast to exaggerate the negative coding of the landscape in relation to the interventions. Field Rotation intentionally went against the subtle slope of the landscape, while Battery Park Landfill used circular voids in the fences that gradually 'sunk' beneath the topography.

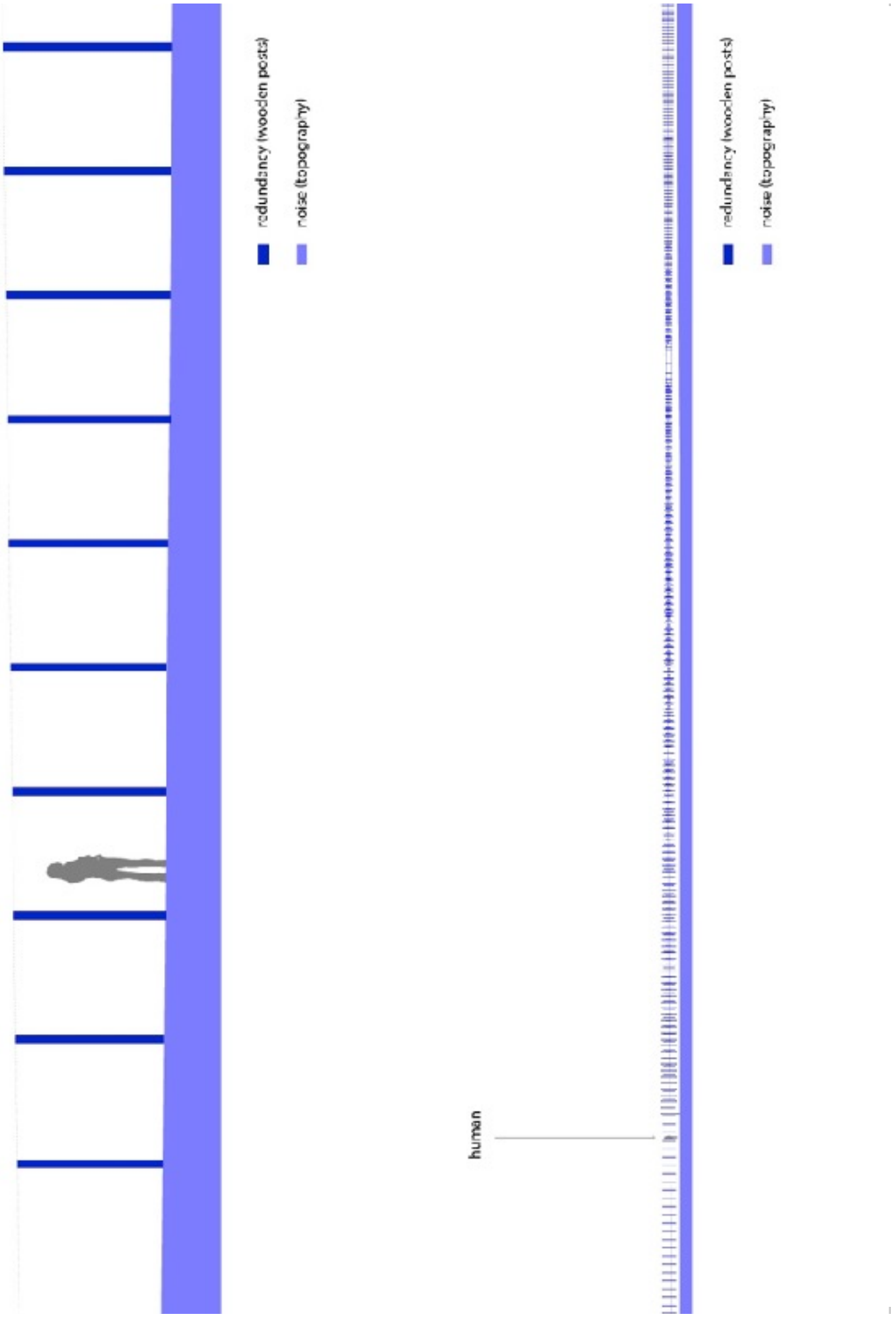

Figure 41. Redundancy, Noise, and Coding Analysis (Field Rotation)

Chapter 5. Discussion

5.1 Summary of Findings

This research further establishes the definition of pattern as a system within architecture and concurrently strengthens the connection between Bateson's understanding of pattern and the understanding of pattern in architecture. The conclusion was accomplished in a variety of ways, which include a literature review of the understandings of pattern in architecture, an investigation of Paul Andersen and David Soloman's research in the usage of pattern in contemporary architecture, an investigation of Gregory Bateson's holistic view of pattern in *Steps to An Ecology of the Mind* and *The Pattern That Connects*, a synthesizing of the information provided by latter bodies of work to create an operational Batesonian based definition of pattern as a system in architecture, a revealing of its use in other theories of pattern in architecture, and finally, a revealing of its use in built projects in order to achieve various conceptual, methodological, and theoretically based goals. A summary of the research is as follows.

The review of literature on the use of pattern in architecture showed that the work of Paul Andersen, David Soloman, and Gregory Bateson would serve as the topic and primary body of knowledge for this project. Upon reviewing their work, it was discovered that it was most relevant to the preliminary interests of this project to define the element of pattern as an effective and diverse tool in architectural design.

Investigation of Paul Andersen and David Soloman's body of work showed that although the authors adopted the terms of redundancy, noise and coding from Bateson in order to explain the ability of pattern to be used as a system in contemporary architecture, they do not explicitly translate how the elements function in relation to the components of a building or the process of architectural design. After reading Bateson's work and understanding the rigor to which he used the components as system, it is arguably a necessary task in understanding how such an idea of pattern can be employed successfully in a building and in the process of architectural design.

The investigation of Gregory Bateson's work revealed the reasoning for David Soloman and Paul Andersen's referring to the systems thinker's theory of pattern as having foreseen the recent re-theorizing of pattern as a system in contemporary

architectural practices. Upon comprehension of the body of work, it can be understood why Bateson's view of pattern is most applicable to the use of pattern in contemporary architecture compared to others. Unlike any other understandings of pattern, Bateson's is unbound to any events, objects, dimensions, or discipline. The principles explained in Bateson's theory of pattern explains how it can be used as a system for establishing information of relationships between a wide variety of events and objects using only the elements of pattern–redundancy, noise, and coding. The self regulating mechanism of these three components is made possible by several key phenomena which include the notions that 'communication is in a way the production of redundancy,' 'there exists redundancy in all universes of the world,' 'multiple languages of description are able to produce incremental knowledge without the introduction of objective information,' 'perception operates only upon the news of difference,' and 'noise is the only possible source for the production of new patterns.'

Opposite to the way pattern is more commonly defined as *that which flows through architecture*, Bateson's writing provides a definition that enables architecture to *flow through pattern*. In doing so, it is possible for a building itself to carry and communicate information in the form of pattern. Because Bateson was able to use pattern as a means of establishing information of relationships between a wide variety of events and objects in the world, it is possible for it to be used in the same way in architectural design. By strategically 'assigning' the components of redundancy, noise and coding to the parts of architecture, one can produce information about or objective perception of relationships. Consequently, architecture can be made to communicate in a highly precise and objective way compared to more conventional design processes.

Similar to the range of ways Bateson was able to use pattern to produce localized information about objects, organisms, and events, the case studies demonstrate that pattern can be used just as much, or perhaps more diversely in architectural design. The case study projects demonstrated pattern being used to produce information in support of specific of concepts, methodologies, and theories. The *nature* of this information could be defined by the design concepts, methodologies, and theories of which they are a part, which include a 'phenomenal or spatial transparency,' a 'tectonic expression,' a 'multisensory experience,' a 'dematerialization' of material, and a 'phenomenal

landscape lens.' However, it should be carefully noted that while the *nature* of the information produced in each case was determined by design concepts, methodologies, and theories, its quality *as* localized information was produced by the mechanism of pattern. This is quite significant given the fact that although the nature of the information was quite complex, it could be produced using only the strategic organization of 'basic' components of architecture. Rather than being driven by complex engineering, cutting edge materials, and or parametric software, the designs were primarily driven by the amount of thought invested in maintaining a premise in which the perception of coding could occur with precision and without compromise. This enables a purity and clarity in the user's experience of the 'concepts' of the respective spaces. For example, to maintain the redundancy of the square geometry in the Zollverein School of Management, a floor plan for the office level integrated circulation space with interior space (figure 42). In the Therme Vals, the structural concept maintained that each stone volume and roof tablet pairing could create its own unique combination of skylight and wall washing light using variations of the same cantilever system.

Figure 42. Office floor plan of Zollverein School of Management (SANAA, *Level 3 Plan*, 2006, CAD drawing, Archdaily, Accessed March 27, 2015. <http://www.archdaily.com/54212/zollverein-school-of-management-and-design-sanaa/>)

5.2 Potential of Pattern as a Mechanism in Architectural Design

Communication and Meaning: Kinesics, Animal Communication, and Dreams

The ability for pattern to create localized information from architecture can be understood as a way for buildings to communicate or expressing meaning. If pattern (as

it has been used in this research) is to be viewed as a means by which buildings can communicate and mean, it is arguable that this research proves it to have potential in this capacity. This makes sense given that pattern is able to produce information that is localized or in other words, embedded within the immediate experience of architecture.

In *Theorizing a New Agenda for Architecture*, Geoffrey Broadbent proclaims that all buildings 'carry meaning' because of the semantic nature of architecture, and therefore, the only way to for buildings to communicate clearly is to do so properly.[42] Broadbent point out that regardless of how much they try to be meaningless, buildings will always be interpreted. For example, despite his efforts to create architecture that does not mean, Broadbent calls attention the idea that Eisenman's House II 'looks like a LeCorbusier Villa.' (p. 131)

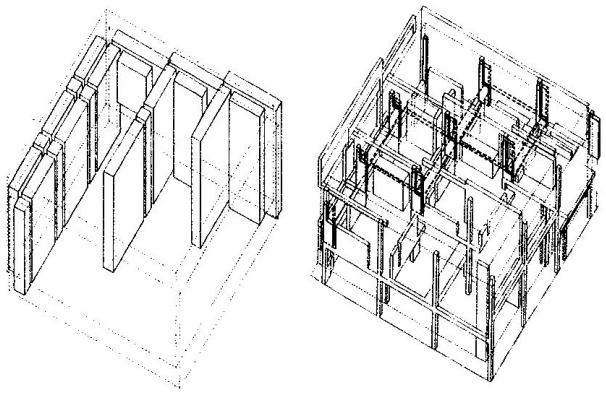

Figure 43. House II, Peter Eisenman (Peter Eisenman, *House II*, 1972, axonometric diagram, "A Plain Man's Guide to the Theory of Signs in Architecture," in Nesbitt, K. 1996. *Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory* 1965-1995. New York: Princeton Architectural Press. 131)

In regard to Broadbent's observations about the inevitable meaning caused by semantics of architecture, it has been shown in this research that when applied to architectural design, Bateson's use of pattern can provide a means through which a building can communicate *using* elements that are part of the cause of its semantics (redundancy). The research shows that not only does pattern enable a clear communication of architecture, but also a wide range of communication, without the need

[42] Geoffrey Broadbent, "A Plain Man's Guide to the Theory of Signs in Architecture," in *Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory*, ed. Kate Nesbitt (New York: Princeton Architectural Press, 1965-1995), 138.

for signs and symbols, or as Bateson might call 'objective information.'

Bateson's discussion of kinesics, animal communication, and dreams further suggests the potential of pattern to enable architecture to produce information, communicate, and mean using a language of redundancy. While these are specific examples that use different mediums and dimensions than architecture, it could be said that they indicate the potentials of pattern to be used *within* the discourse of architecture. This is observable in the ability of the perception of transparency of two dimensional cubist paintings to be applied to the three-dimensional spatial perception of architecture (figure 28).

In kinesics (the interpretation of non-verbal communication such as facial expressions and gestures), humans rely strictly on the coding of nonverbal gestures that accompany redundant verbal communication. For example, when a boy tells a girl 'I love you,' she commonly sees his tone of voice or bodily gestures accompanying the words as more indicative of the truth or meaning of the expression in comparison to the words themselves. In the case of kinesics, the relationships between words and the bodily gestures are *more* important than the words and gestures themselves. In some cases, these relationships generate meanings that are neither a part of the words nor the gestures. In certain situations, 'I love you' accompanied with certain gestures can indisputably mean 'I'm sorry,' 'I miss you,' 'I desire something,' or the like. Furthermore, Bateson points that out that we go as far as almost disregarding verbal communication in favor of kinesics in situations that are most critical, such as those that concern issues of love, fear, hate, dependency, etc.

The study of 'primitive' animal communication takes the above phenomenon a step further. Bateson points out that animal communication is confined to signals that are derived from actions of the animals themselves, and therefore their communication is completely dependent upon redundancy and context.

Bateson stated that 'dreams can propose the applicability of pattern.' [43] His reasoning behind this is the fact that the *referents* of a dream are but relationships that a dreamer consciously or unconsciously perceives in the waking world. However, within the dream, the relata (group of related things) are unmentioned and irrelevant to the

[43] Gregory Bateson. *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc,1972), 430.

nature of the relationship itself. There is also no signal that tells the dreamer that its referents are referents, and no perception of past or present tenses. In other words there is no frame that indicates that the dream as literal nor is there a frame that indicates it is metaphor. Bateson finds that these unique characteristics are 'archaic in an evolutionary sense.'

To various degrees, kinesics, animal communication, and dreams all demonstrate situations in which complex communication or meaning, is produced solely through redundancy (as it has been described in this research), that is, without the knowledge of more 'objective information' (ie. verbal communication). Bateson points out that in the case of dreams, meaning in the dream–in the form of experiences–is not only achieved through redundancy (redundant in the sense that they are based on experiences in our waking world), but even more profoundly, the element of context that is normally required for redundancy to operate as a form of producing information/meaning, is not present.

Archaicness as Advanced

It could be said that the *essence* of the mechanism of pattern as it exists in architecture is expressed in the below image from the 1999 film entitled *The Matrix*. The image depicts what the main character *Neo* 'sees' once he takes control of his ability to manipulate the computer-virtualized world that humans have been subjected to in the year 2199 (although Neo is in fact plugged into a computer and the image is therefore only used to give the viewers of the film a three-dimensional understanding of what is occurring only in digital space, the depiction as it exists independent of circumstances from which it arose, is what is relevant to the following point).

Figure 44. Image taken from *The Matrix*, 1999 (The Matrix, directed by Andy Wachowski and Lana Wachowski, (1999; Burbank, CA: Warner Home Video, 1999), DVD.)

The image portrays three ideas which include: 1. the possibility that all dimensions of the world, both tangible and intangible, living and non living are able to be expressed and related through a singular language; 2. architecture can be designed as an integrated and seamless part of that language; 3. architecture that is designed through that language is therefore composed of the same substance as the living world and in that sense is universal and un bound to the passage of time.

Like the ideas expressed in the image, this research suggests that 1. redundancy is a language that is embedded in in all dimensions of the world, both tangible and intangible and living and non-living; 2. through pattern, architecture can be designed purely through the language of redundancy; 3. architecture that is designed through redundancy is highly universal and timeless. [44]

[44] Joshua Shishido, "Use of Pattern as a Mechanism in Architectural Design" (master's thesis, Tongji University, 2015), 1-54.

Chapter 6. Design Research

6.1 Key Points and Application of New Knowledge

Produced by the preceding research are positive answers to this project's initial question of whether or not pattern can operate as a mechanism for producing localized information in architecture (section 5.1) and in doing so be used as a means of objectively executing concepts in architectural design.

It was discovered that this is possible by integrating a 'premise for coding'– or a form of mapping – into the experience of architecture through the strategic and rigorous organization of the material, scale, and dimension independent components of difference, redundancy, and noise (based primarily on the writings of Bateson and supported by Andersen and Soloman). The previous findings begin to provide positive answers to the specific questions formed after the literature review of Bateson's theory which include how easily can Gregory Bateson's theory of pattern translate to the analysis and process of architectural design? If it can be translated successfully, how complex and concise is the experience of the information it can produce in a work of architecture?, to what extent can it be inclusive of both formal and spatial dimensions as Eisenman stated is the main challenge of clear meaning in conceptually based architecture?, and how consistently can it be used in this fashion?

The previous research began to answer the above questions by forming a rigorous and clear logic of how Bateson's writings translate to the discipline of architecture. Using that logic as a form of 'lens,' the research showed through examples how Bateson's theory of pattern does in fact function in architecture in the way Andersen and Soloman claimed it can. This can be seen especially in the case studies where in which, pattern functioned as a means for enabling greater ideas or concepts such as 'transparency,' 'dematerialization,' 'a multisensory experience,' etc. to be perceived in an objective way in a given project. Like Schonberg's system of atonalism, which provided a flexible 'platform' through which music could be conceptualized in different ways yet in a consistent manner (section 2.5), it was shown that the view of pattern as a form mechanism can provide the same sort of platform for architectural design.

The following research will continue to answer the questions formed in the literature review through applying the logic established in chapter 3 to a design project that employs a conceptually based approach in architectural design. Because the findings of the previous research showed that the mechanism of pattern could function as a means *executing a concept* (as opposed standing alone as one) in an objective way, a major parameter that the design research will establish is the design concept itself. This will be done by investigating how the design concept used (to be determined in section 6.6 based on analysis of programmatic, physical, and cultural contexts) has been executed in the past, and comparing those outcomes with how it is determined that the mechanism of pattern can achieve the concept.

Consequently, the 'context' of the design project will be defined not only as the physical and cultural aspects of a context in which a project is located, but also the design concept through which it is executed. Just as much as the previous research is being tested in its ability to directly address the parameters of a site, it is also being tested in its ability to effectively address *the parameters of a concept*. The two are undeniably linked and overlap each other in the design process, however, because of the highly specific direction of this research and the purposes of answering the questions formed after the literature review, the design concept itself will be regarded as a form of context to be investigated, understood, and satisfied just as much as the program, physical and cultural contexts.

6.2 Project Summary

The conceptual project context in which the research will be applied is the planning and design of a visitor interpretation center for a wind farm located in a highly remote, natural, and culturally sensitive site on the north shore of the island of 'Oahu, Hawai'i. The site is private and there are no other buildings existing within a one and a half mile radius. While the wind farm is the source of sustainable energy and provides power for 14,500 homes and up to ten percent of the island's power, a primary issue with the project is the negativity to which it has been received by native Hawaiians. While the site provides optimal wind speed and frequency, it is also has significant cultural significance. Thus, it necessary that the design of the visitor interpretation center is not

only sensitive to this issue, but might also perhaps serve somewhat of a mediating role. A comprehensive description of the wind farm development is as follows.

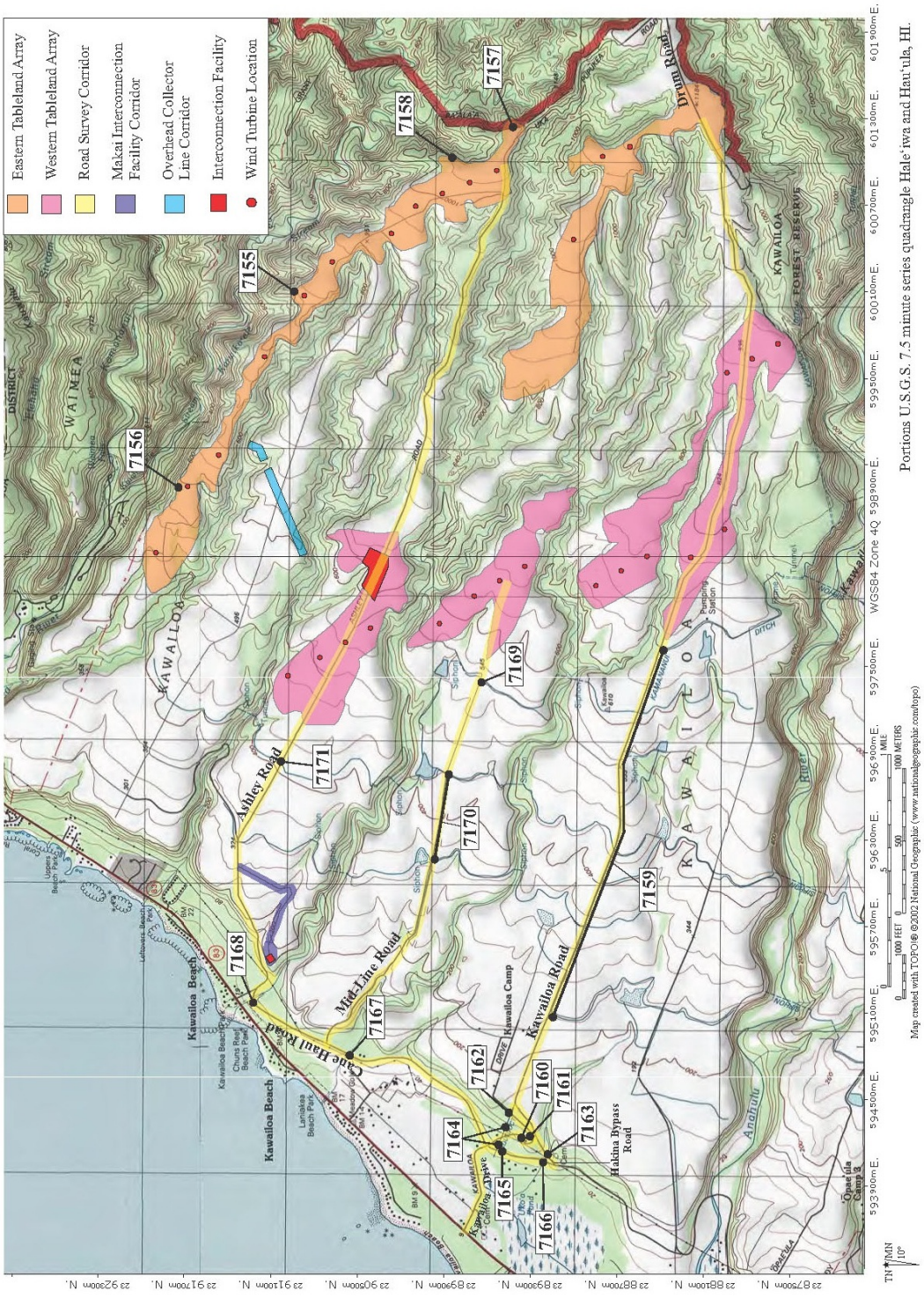

Figure 45. Map of Kawailoa wind farm (CH2M Hill, *Project area map showing site locations*. map. Honolulu, HI: State of Hawai‘i Department of Health, 2011. From *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, State of Hawai‘i Office of Environmental Quality Control EA and EIS Library.
<http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/2010s/2011-07-08-FEIS-Kawailoa-Wind-Farm.pdf>)

6.3 Theoretical/Cultural Context

The site of the Kawailoa Wind Farm has a significant historical and cultural context, which is the reason for the controversy surrounding it. Prior to the construction of the wind farm, First Wind was required to perform an environmental impact statement (EIS). As part of the 876 page long EIS, a cultural impact statement was conducted by Cultural Surveys Hawai‘i.[45] This document discusses the significant cultural context surrounding the wind farm development. A summary of the CIS as it pertains to the design of the conceptual design of the visitor interpretation center is as follows.

The *moku* or district in which the project is located is called Waialua. Within Waialua are eight *ahupua‘a* or regions, one of which is Kawailoa. Along with the regions of Kamananui and Pa‘ala‘a, Kawailoa composed the fertile center of the Waialua district and likely supported the majority of the Waialua population in ancient Hawai‘i.

While there are others along the northern coast of ‘Oahu that have yet to be discovered archaeologically, an ancient Hawaiian settlement complex was un earthed in Anahulu Valley and dates back to 1300 A.D. This settlement is located on the southern end of the 4,200 acre wind farm site. Within this settlement are numerous habitation sites, rock shelters, irrigation systems, and dry land agriculture remains.

Mo‘olelo or Hawaiian oral traditions indicate there to be a kingship that took place in the up lands of the Waialua district. In addition to being considered the *piko* or center of O‘ahu, the site called Kukaniloko was known to be the place of birth of *ali‘i kapu* or sacred chiefs. These chiefs were regarded in ancient Hawai‘i as *akua* or gods of land. The *ahupua‘a* land division system is known to be established in 1400 A.D. by Ma‘ilikukahi, an *ali‘i kapu* who was born at Kukaniloko.

A Hawaiian *mo‘olelo* known as *The Wind Gourd of La‘amaomao* tells the story of how two descendants of the wind god *La‘amaomao* named Paka‘a and Kuapaka‘a contained the winds of Hawai’i within a gourd and were able to call them forth through chanting. The chant itself traces the winds of O‘ahu, the Waialua *moku*, and the wind that blows in a location upland from the wind farm site called mount Ka‘ala. Other *mo‘olelo* link the gourd of *La‘amaomao* to a Hawaiian god named Lono, considered to be

[45] Joseph H. Genz and Hallett H. Hammat, June 2011. “Cultural Impact Assessment for the Proposed Kawailoa Wind Farm Project, Multiple Ahupua‘a, Waialua District, O‘ahu Island.” Cultural Surveys Hawai‘i Inc: Kailua, Hawai’i.

a cosmic gourd that contained not winds but also clouds and rain. CSH remarks that a cultural connection can be made between such oral traditions and modern wind farms' act of capturing and harnessing energy from the wind.

Mount Ka‘ala is the highest point on O‘ahu island and considered to be a sacred place. Hawaiian priests or *Kahuna* describe Mount Ka‘ala as "clothed in the golden cloak of Kane (god)," and as a resting place for the spirits of the dead. Another accounts remark that the summit as a resting place for souls traveling down the spine of the Wai'anae mountains to Ka'ena point, a place where spirits of the dead leap in to the next world, or a place for weather forecasting and making prophecies.

Investigation of the 4,200 acre project footprint indicate that there are no *heiau* (shrines) or native Hawaiian cultural sites within its immediate boundaries. However, there is documentation of freshwater fishpond located near the summit of Mount Ka‘ala, a *heiau* called ‘Ili‘ilikea (destroyed in 1916 by Waialua Agricultural Company) located at the ocean side entrance to the wind farm, and a complex of partially enclosed terraces platforms and walls called Kahokuwelowelo also located at the entrance. There are numerous burials located in the Kawailoa and the Kamananui (southwest of Kawailoa) regions. The closest to the boundaries of the site are in Anahulu Valley and along the coastal side of Kawailoa on the inland side of Kamehameha Highway.

There are accounts of several indigenous Hawaiian cultivation practices within the project footprint. Mulitple *apana* or lots are documented to have existed in the wind farm site and contained taro, bananas, bitter gourds, melon, corn, sugarcane, and sweet potatoes. Nearby *pali* or cliffs are known to have cultivated *wauke* or paper mulberry.

During the nineteenth century, the landscape of the Kawailoa region changed significantly due to its being used for rice, sugar, and pineapple cultivation. The establishment of the ‘Oahu Railway and Land Company contribute to the rise of the Waialua Agricultural Company, later called the Waialua Sugar Company. The wind farm project site is encompassed within the 6,000 acres of sugar cultivation known as the Kawailoa Plantation. Upon the closing of the Waialua Sugar Company in 1998, Kamehameha Schools started managing the plantation as a diversified farming operation.

In addition to conducting the above background research, Cultural Surveys Hawai‘i documented the responses of 17 out of 37 community members contacted for

cultural consultation on the wind farm project. Of the 17 individuals were nine *kupuna* (elders) and/or *kama'aina* (native born). There was a range of opinions within the group of community members that were interviewed. Four individuals were in support of the project so long as it would be done *pono* (in the correct way), while others felt that it would have a significantly negative affect to the site's cultural properties (discusses in the above background summary) of Kawailoa. For the purpose of this design project, examples of the opinions that contain suggestions for how the project can be done *pono* are as follows.

A Mrs. Agader discussed that Kamehameha Schools had recently planted native species of *koa* trees in upland areas of Kawailoa and a Mrs. Cayan who is the History and Culture Branch Chief of the SHPD recommended that access and gathering rights should be permitted to the Kawailoa lands for activities related to Hawaiian spirituality, traditional burials, hunting, and hiking. A Mr. Au states he would be in support of the project if it benefits local Hawaiian people and is not an attempt for outsiders to gain wealth. Mr. Au, a Ms. Betty Jenkins, and a Mr. Labra state that if the project is not done *pono*, the winds may stop blowing.

The Significance of Location/Place in Native Hawaiian Culture

Like all locations in Hawai'i, the site of the Kawailoa wind farm is understood in Native Hawaiian culture as a place. Similar to its understanding in architecture, the Hawaiian idea of place is different from space in that it is a qualitative, subjective, and intangible idea. Like a person, a place contains as well as gives identity in Hawaiian culture.

In *This Land is My Land: The Role of Place in Native Hawaiian Identity*, Shawn Kana'iaupuni and Nolan Malone discuss the importance of place to Native Hawaiian identity. With respect to Native Hawaiians, the authors emphasize the inseparability between people and place through three ideas that include physical and spiritual ties to place, genealogical ties to place, and sociopolitical/historical ties to place. This fact must be considered in any intervention in the land within Hawai'i. The following section will summarize the authors' ideas in order to express the significance of place in Hawai'i.

Kana‘iaupuni and Malone point out that the physical bond between Hawaiians and the land is reaffirmed at birth and death. Evidence of this can be observed in the Hawaiian ritual of planting the afterbirth and umbilical cord of newborns beneath the ground. [46] Oliveira writes, “This relationship is further reinforced when a person’s physical body dies and is *kanu‘ia* or planted. A death, burying a person in the land brings this relationship full circle. Furthermore, Oneha writes that ‘ka mauil o ka ‘aina a he mauli kanaka, or the life of the land is the life of the people.’ Throughout history up to the present day, Hawaiians see their relationship with the land as intimate and reciprocal in that one takes care of the land, and the land takes care of them.

Another example of the inseparability between people and place can be seen in genealogical traditions in Native Hawaiian culture. Not only in Hawai‘i, but in all Pacific cultures, one’s identity is understood by establishing genealogical connections to their ancestors. [47] This ancestry is not only traced back to humans, but the natural world as well because it is believed that humans and nature are birthed from the same origins. The belief can be observed in the Native Hawaiian creation stories. Furthermore, it is commonplace at formal public events for one to introduce themselves through their connection to a specific geological feature such as a mountain, valley, bod of water, etc.

Finally, a significant connection between Native Hawaiians and place can be seen in their sociopolitical or historical ties. This connection is similar to the previous, but it pertains to the place and Native people of Hawai‘i as a whole. Kana‘iaupuni and Malone quote Kana‘iaupuni and Liebler (2005) in their identifying that–especially critical to Native Hawaiians today–Hawai‘i, the place, connects the Hawaiian diaspora through “social relations and a historical memory of cultural beginnings, meanings, and practices, as well as crises, upheavals and unjust subjections as a dispossessed and (mis)recognized people.” [48]

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[46] S.M. Kana‘iaupuni and N. Malone, “This Land is My Land: The Role of Place in Native Hawaiian Identity,” in *Hulili: Multdiciplinary Research on Hawaiian Well-Being*, ed. Shawn Kanaiaupuni (Hawai‘i: Kamehameha Schools, 2006) 289.

[47] Ibid., p. 290-291.

[48] Ibid., p. 291-292.

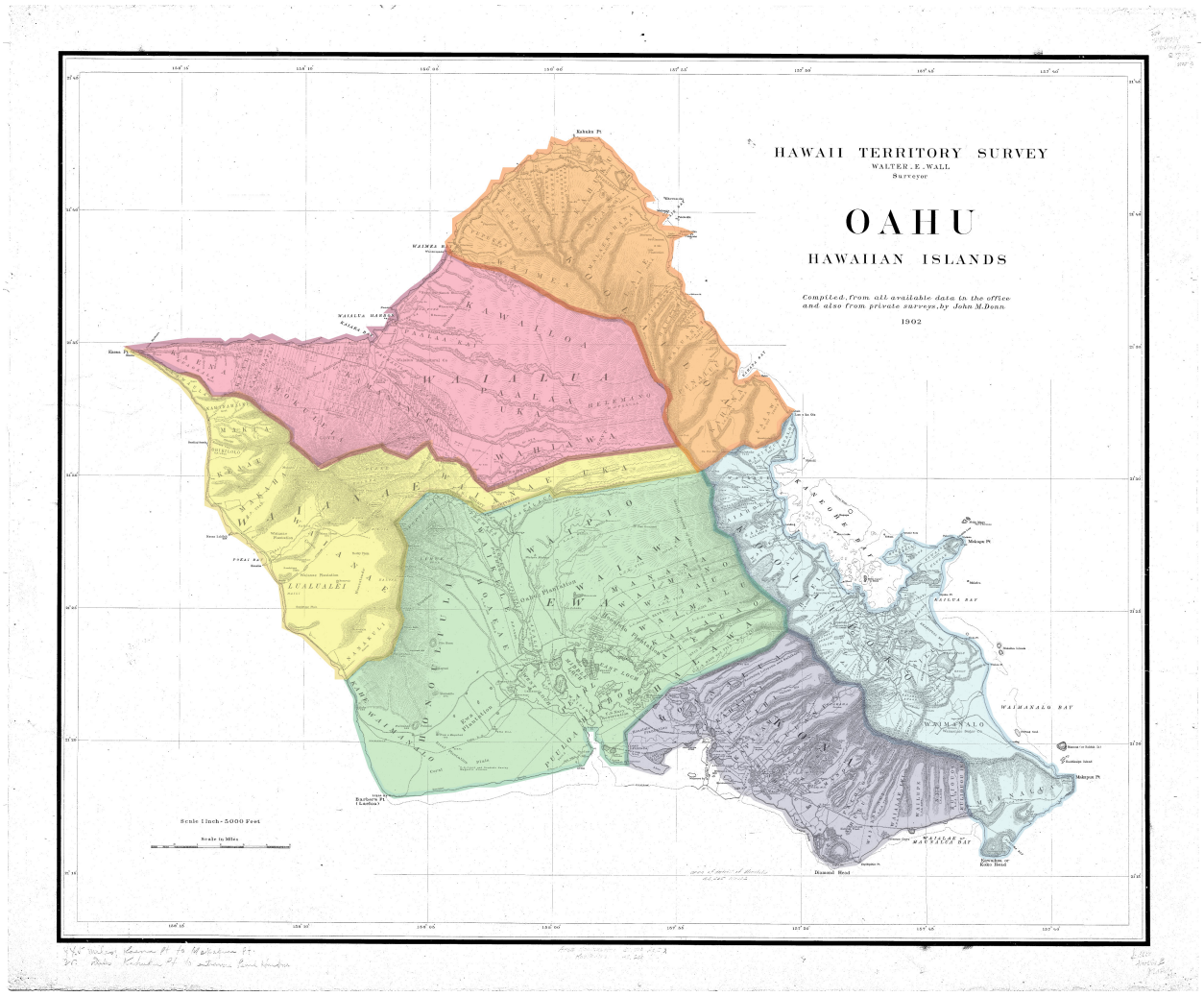

Figure 46. Map of moku and ahupuaa land divisions of ‘Oahu (Walter E. Wall, *Hawai‘i Territory Survey*. map. 1902. Avakonohiki: Ancestral Visions of Aina. http://www.avakonohiki.org/o699ahu.html (accessed march 28, 2015).)

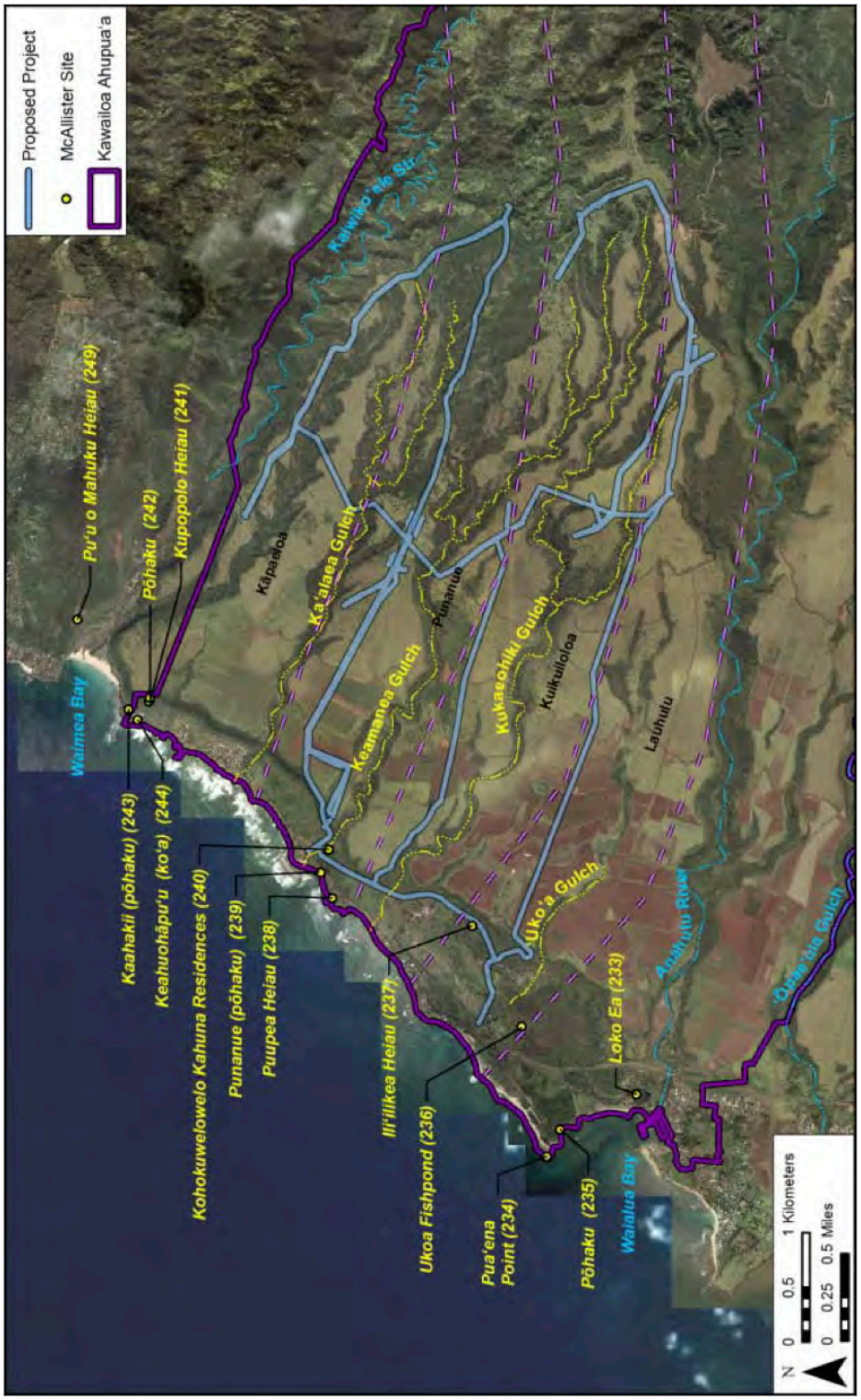

Figure 47. Map of cultural features near project site (CH2M Hill, *Known locations of wahi pana of Kawailoa Ahupua'a in the vicinity of the permanent project footprint*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, Appendix C, 18.)

6.4 Physical Context

The conceptual project is the design of facilities for the Kawailoa Wind Farm in Kawailoa, Hawai‘i. The project consists of the redesign of an operation and maintenance building and the design of a visitor interpretation center at the entrance of a 4,200 acre site In addition to the operations building, there are currently 30 wind turbines on the site that have combined 69 mw capacity. A summary of the program and physical context are as follows. Much of the data presented on the physical context of the project is taken from the Final Environmental Impact Statement for the Kawailoa Windfarm Project prepared for First Wind LLC by CH2M Hill.[49] Supplementing the physical context data provided in the EIS are geological mappings, historical mappings, additional site photos produced by the architectural firm that designed the existing operations building, and digitally produced climate data taken from the nearest weather station located in Barbers Point.

Project Location

The conceptual project location is in Kawailoa, O‘ahu, on lands that were previously used for a plantation. Located five miles northeast of Haleiwa Town, the site is part of the Waialua Ahupuaa. Its boundaries utilize 4,200 acres of a 7,000 acre property owned by Kamehameha Schools. Roads in and out of the site were previously used for transportation of sugar cane.

Site History

Prior to its use for agriculture, the land was forested with Ohia and Koa trees in addition to smaller native trees and shrubs. Upon western colonization in the late 1800’s, the area was cleared and converted for use in sugar can agriculture. For a time period of about 100 years, the land went through cycles of plowing, burning, and harvesting and planting. Gulches were used for pasturing horses and mules, which resulted in the further decrease of native species of plants. In addition, feral pigs that have infested the area

[49] Paul Luersen, June 2011. “Final Environmental Impact Statement: Kawailoa Wind Farm Project.” CH2MHILL: Englewood, Colorado.

have also reduced amount of native plants. The charts below list the native plant species within the vicinity of the site.

Wind Turbines

The 34 wind turbines are grouped in sequences of three to four throughout the 4,200 acre site. The towers are 327 feet high and taper from 15 feet in diameter at the base, to 10 feet in diameter at the top. Each weighs 175 tons. Turbine blades span 170 feet and weigh 22 tons each. All towers have a built in safety ladder. Each turbine is driven by a nacelle that houses a gearbox and generator. Nacelles weigh 90.4 tons. Electronic equipment at the base of towers houses controls, electrical cables, and a transformer. The foundation of each turbine is 46 feet square with a depth of about 10 feet below grade. Power lines are located underground.

Roadways

The wind farm project area is serviced by a combination of state, county, and privately owned roads. Roads within the site are privately owned by Kamehameha Schools and composed of gravel.

Existing Operations and Maintenance Building

The existing operations and maintenance building is composed of a prefabricated steel structure and sheet metal cladding. It is 7,000 square foot and around 22 feet tall. The building form is a rectangular box with a pitched roof and houses the windfarm's system controller (which monitors performance and status of turbines and wind conditions), an indoor work area, and storage of spare parts. Offices for the site manager and maintenance workers are also located in this building. A total of about ten workers utilize the building including engineers, maintenance workers, and a biologist.

Climate (macro and micro)

The temperature swings in Hawai‘i's climate are minimal, contributing to classification of two seasons, winter and summer. During warmer summer months, trade winds are prevalent almost all the time, while there is a decrease in trade winds during

winter months. Humidity is moderate throughout the year. In mountainous areas, rainfall can be significant ranging from 20 inches to 300 inches.

The immediate site of the project is moderately rainy, has frequent trade wind showers, and has partly cloudy to cloudy days. Rainfall generally occurs between October and April, while average annual rainfall is about 39 inches. The prevailing wind direction is from the east.

Air Quality and Noise

The air quality at the site is relatively good because of low levels of development and automobile emissions in the area, and the location's high level of exposure to tradewinds. The sound generated by the turbines is a 'swishing' or 'whooshing' noise caused by the turbine blades' interaction with the wind.

Hydrology and Water Resources

The site of the project is located nearby five watersheds which include Waimea, Keamanea, Loko Ea, Anahulu, and Kawailoa. The natural intermittent streams include Elehaha, Kaiwikoele, and Kamananui.

Visual Resources

With the area being located on the North Shore of O'ahu which is known for the aesthetic appeal of its shoreline, the elevated site offers any opportunities for both ocean and mountain facing views. Waimea Bay, Chun's Reed, Lanniakea, Pua'ena Point, and Haleiwa Beach Par are a few of the well-known sites in the vicinity.

Geology, Topography and Soils

The windfarm site covers a wide range of topographies from moderately sloping agricultural lands at lower elevations to slopes of 50 to 60 percent at valley heads and at the base of Ko'olau mountain range. There are intermittent streams throughout the site. The elevations begin at 200 feet above sea level to 1,280 feet.

There are multiple soil types present at the site ranging from silty clays to rocky soils along stream boundaries. The majority of the soil in the area is derived from

weathered basalt from upland areas and is reddish in color. Given the soil types in the area, the land is designated as 'prime' agricultural land by the ALISH system (Agricultural Lands of Importance to the State of Hawai'i).

Predominant soil types on the Kawailoa Windfarm site		
Soil Type	Runoff	Land Uses
Lahaina silty clay	slow to medium	agricultural/pasture/woodland/wildlife habitat
Leilehua silty clay	slow to medium	agricultural/pasture/woodland/wildlife habitat
Wahiawa silty clay	slow to medium	agricultural/pasture

Figure 48. Predominant soil types on the Kawailoa Windfarm site (CH2M Hill, *Characteristics of the Predominant Soil Types Within the Kawailoa Wind Farm Site*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, 3-13, table 11.)

Native plant species on the Kawailoa Windfarm site	
Common Name	Scientific Name
kilau	*Pteridium aquilinum*
hapu'u	*Cibotium chamissoi*
uluhe	*Dicranopteris linearis*
pala'a	*Sphenomeris chinensis*
ni'ani'au	*Nephrolepis exaltata*
pakahaka	*Lepisorus thunbergianus*
moa	*Psilotum nudum*
halapepe	*Pleomele halapepe*
n/a	*Carex meyenii*
n/a	*Carex wahuensis*
n/a	*Cyperus polystachyos*
'ie'ie	*Freycinetia arbore*
lama	*Diospyros sandwicensis*
pukiawe	*Leptecophylla tameiameiae*
koa	*Acacia koa*
nanea	*Vigna marina*
naupaka kuaiwi	*Scaevola gaudichaudiana*
kauna'oa pehu	*Cassytha filiformis*
'uhaloa	*Waltheria indica*
huehue	*Cocculus orbiculatus*
'ohi'a	*Metrosideros polymorpha*
olopua	*Nestegis sandwicensis*
kopiko	*Psychotria mariniana*
alahe'e	*Psydrax odorata*
'iliahi	*Santalum freycinetianum*
'a'ali'i	*Dodonaea viscosa*
'akia	*Wikstroemia O`ahuensis*
ulei	*Osteomeles anthyllidifolia*

Figure 49. Native plant species on the Kawailoa Windfarm site (CH2M Hill, *Native Plant Species Identified at the Kawailoa Wind Farm Site*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, 3-27, table 15.)

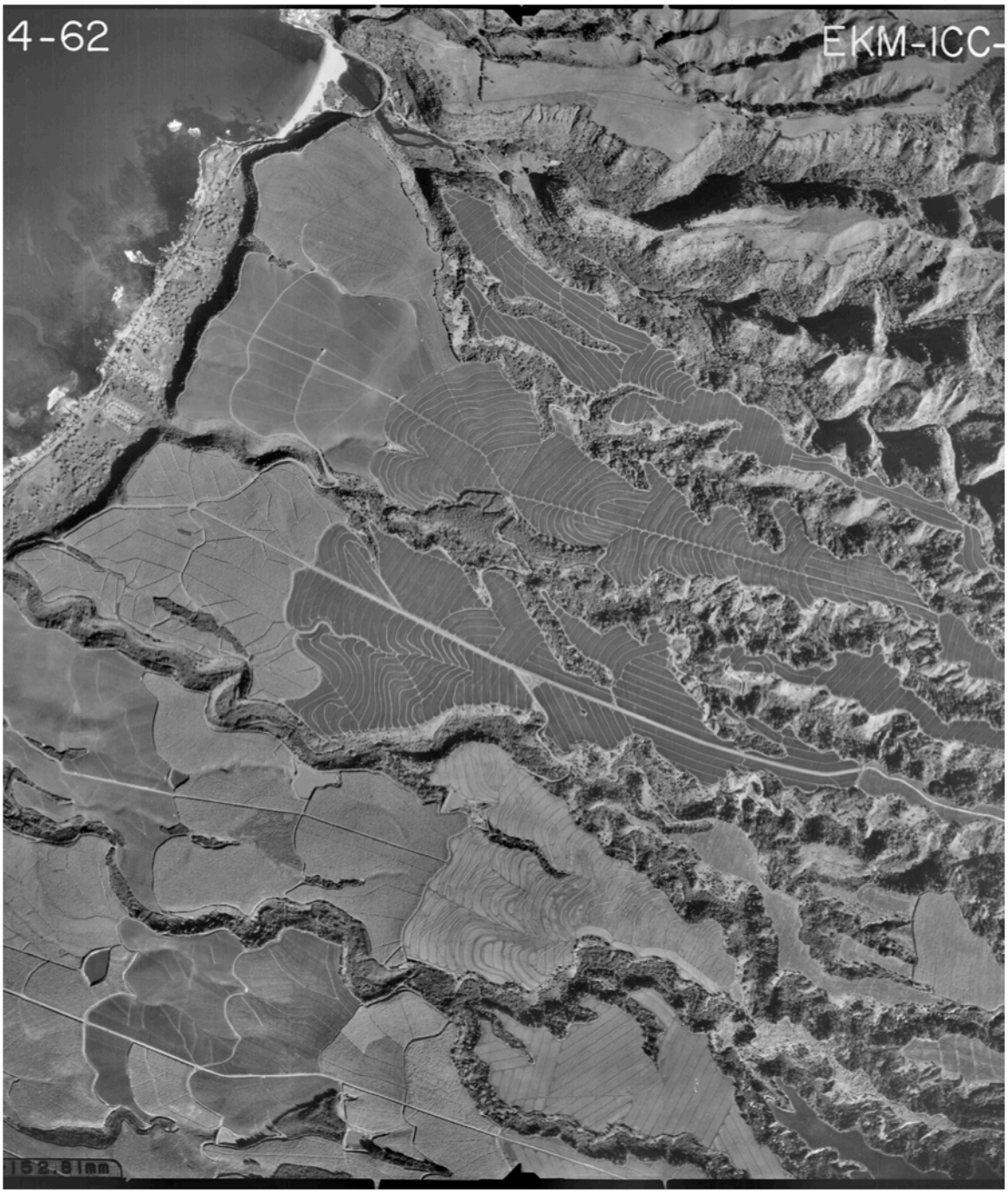

Figure 50. 1962 Aerial photograph of site showing agricultural usage (*Aerial photograph of a portion of the study area taken on December 4, 1962*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, Appendix B, v.)

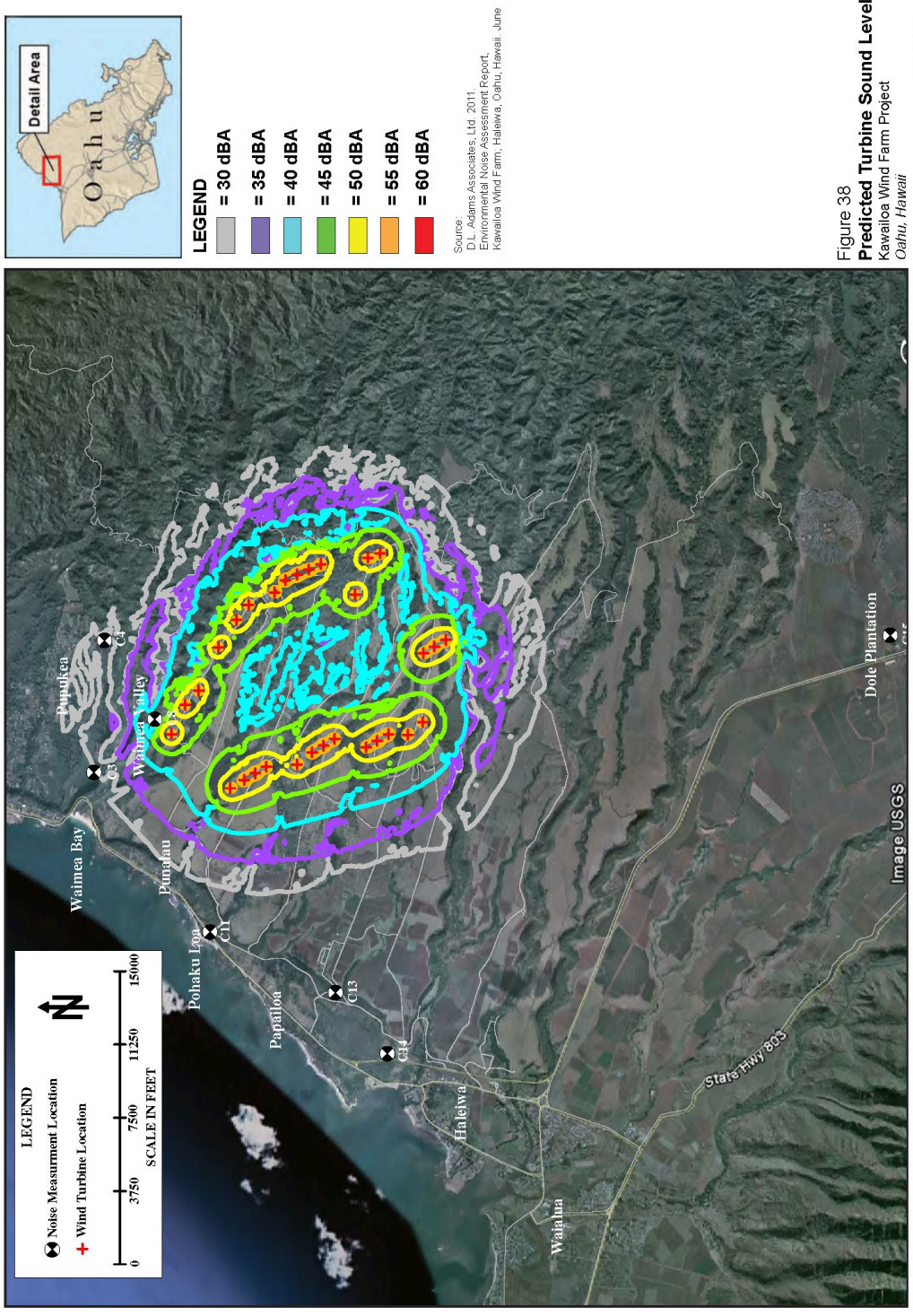

Figure 51. Map of sound levels produced by wind turbines (CH2M Hill, *Predicted Turbine Sound Levels*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, 3-121, figure 38.)

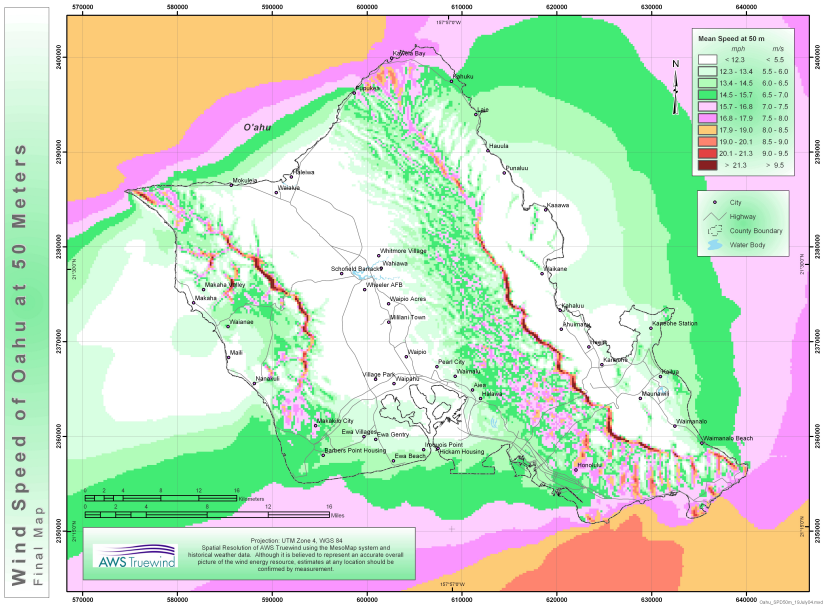

Figure 52. Map of wind speed relative to elevation (Hawaiian Electric, "High Resolution Wind Resource Maps," Hawaiian Electric, accessed March 28, 2015, http://www.heco.com/vcmcontent/StaticFiles/Images/Articles/HonoluluCounty_Oahu_SPD50m_19July04_080504_0936.jpg.

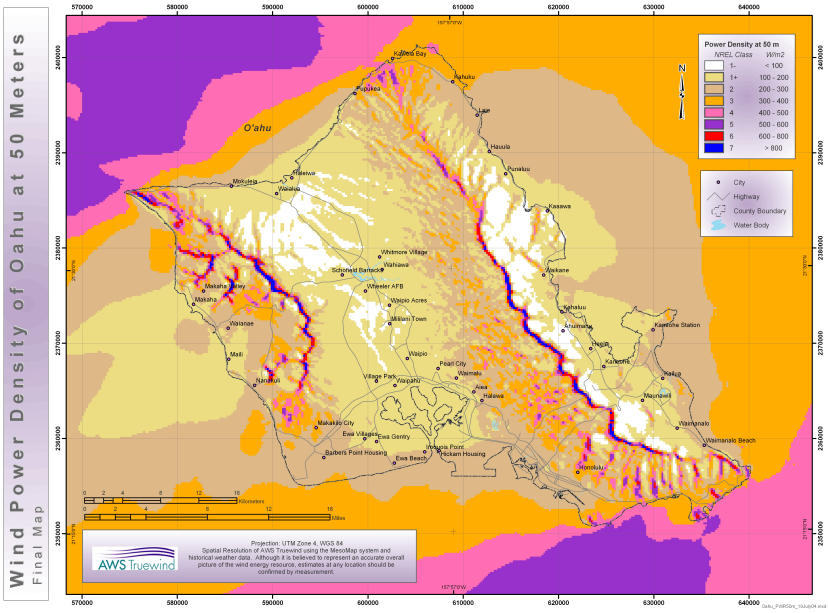

Figure 53. Map of wind power density relative to elevation (Hawaiian Electric, "High Resolution Wind Resource Maps," Hawaiian Electric, accessed March 28, 2015, http://www.heco.com/vcmcontent/StaticFiles/Images/Articles/HonoluluCounty_Oahu_PWR50m_19July04_080504_0801.jpg.

WEATHER DATA SUMMARY

LOCATION: Ewa/Barbers Point NAS, HI, USA
Latitude/Longitude: 21.32° North, 158.07° West, **Time Zone from Greenwich** -10
Data Source: TMY--22514 911780 WMO Station Number, **Elevation** 49 ft

MONTHLY MEANS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Global Horiz Radiation (Avg Hourly)	113	130	143	147	152	152	154	156	149	136	118	112	Btu/sq.ft
Direct Normal Radiation (Avg Hourly)	120	123	111	104	109	115	122	132	130	134	129	135	Btu/sq.ft
Diffuse Radiation (Avg Hourly)	44	51	66	69	68	65	63	58	56	47	40	36	Btu/sq.ft
Global Horiz Radiation (Max Hourly)	248	271	293	307	300	304	296	303	305	274	248	222	Btu/sq.ft
Direct Normal Radiation (Max Hourly)	292	276	261	257	239	245	241	253	267	263	284	287	Btu/sq.ft
Diffuse Radiation (Max Hourly)	103	127	134	140	139	135	129	118	131	116	102	97	Btu/sq.ft
Global Horiz Radiation (Avg Daily Total)	1237	1473	1714	1843	1982	2027	2035	1993	1813	1572	1298	1201	Btu/sq.ft
Direct Normal Radiation (Avg Daily Total)	1313	1392	1325	1310	1425	1538	1603	1688	1577	1550	1424	1448	Btu/sq.ft
Diffuse Radiation (Avg Daily Total)	478	586	792	863	898	873	829	736	680	542	440	394	Btu/sq.ft
Global Horiz Illumination (Avg Hourly)													footcandles
Direct Normal Illumination (Avg Hourly)													footcandles
Dry Bulb Temperature (Avg Monthly)	71	71	72	73	75	77	77	78	78	77	75	73	degrees F
Dew Point Temperature (Avg Monthly)	64	61	62	63	64	66	66	67	67	67	67	63	degrees F
Relative Humidity (Avg Monthly)	79	72	73	71	69	70	70	70	71	71	76	72	percent
Wind Direction (Monthly Mode)	60	20	50	20	50	60	50	50	50	50	60	20	degrees
Wind Speed (Avg Monthly)	8	9	10	9	8	7	8	8	7	6	8	8	mph
Ground Temperature (Avg Monthly of 3 Depths)	73	72	72	73	74	75	77	77	76	76	74	73	degrees F

Figure 54. Annual Weather Summary (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*, computer program. Available from Energy Design Tools, UCLA Department of Architecture and Urban Design, California, http://www.energy-design-tools.aud.ucla.edu/.)

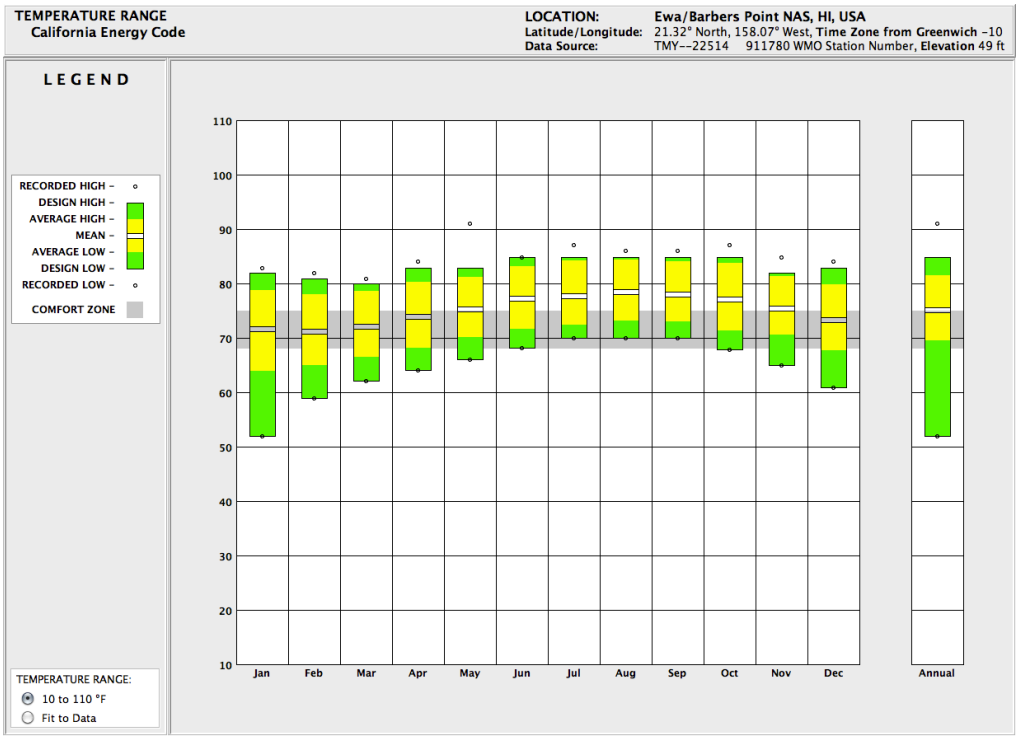

Figure 55: Temperature Range (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.

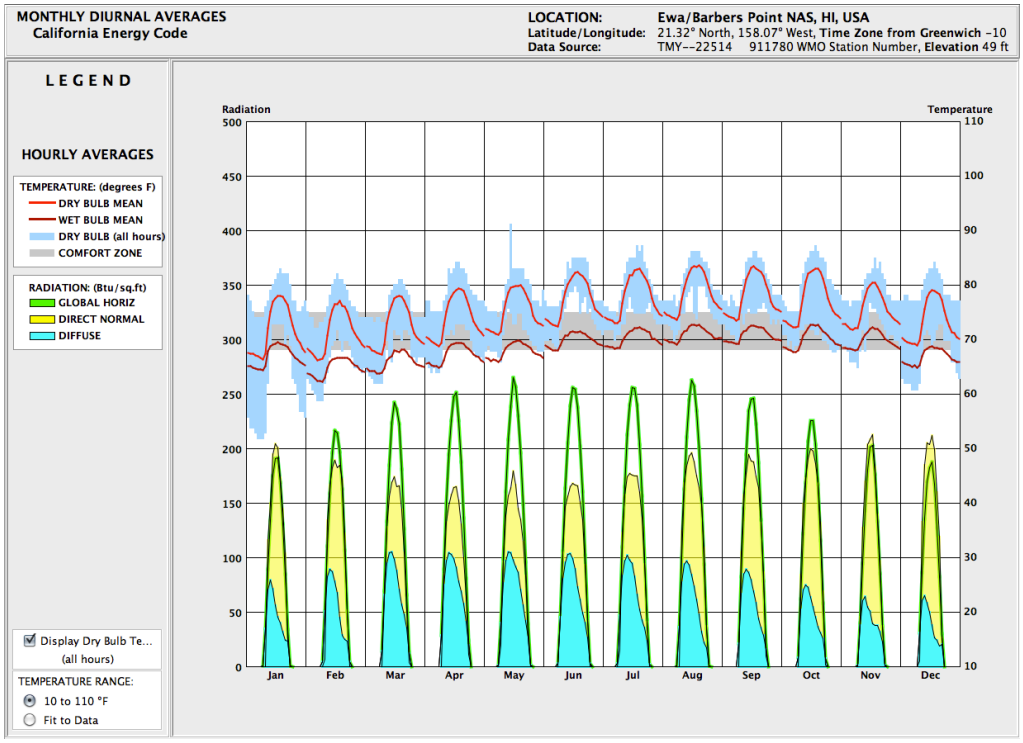

Figure 56. Monthly Diurnal Averages (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

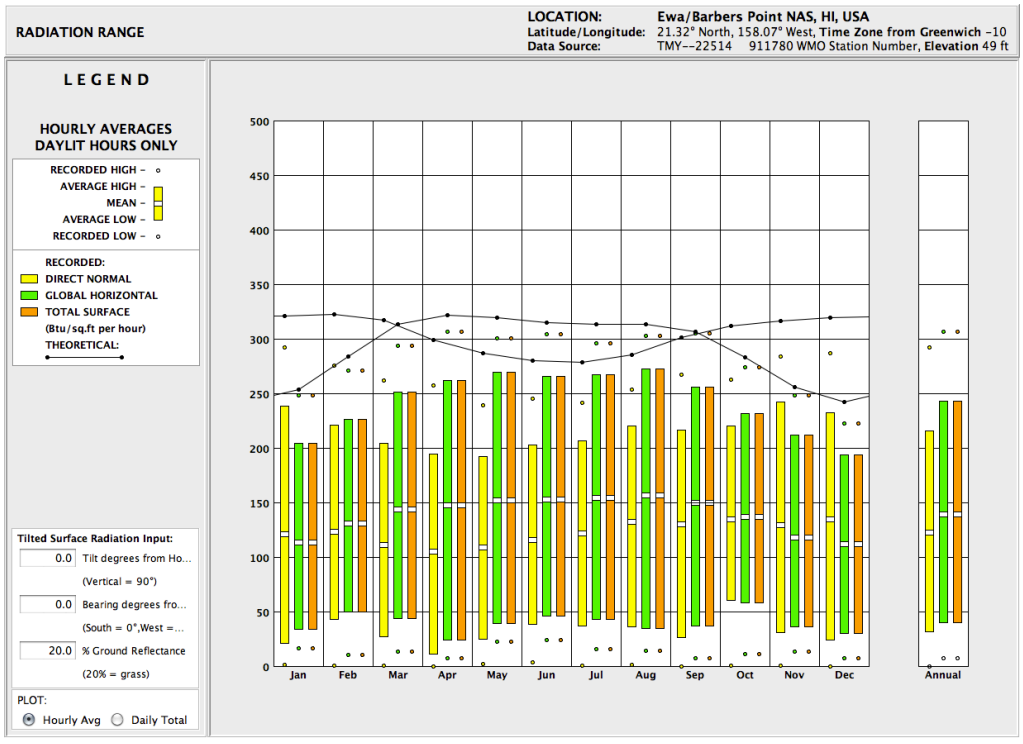

Figure 57. Radiation Range (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

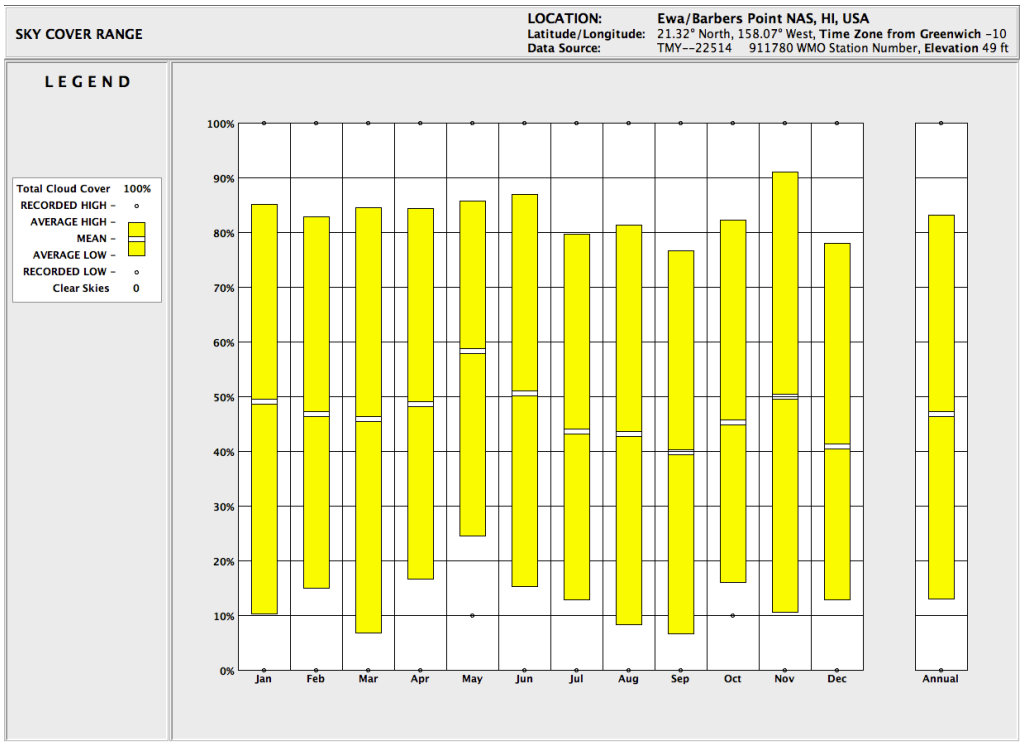

Figure 58. Sky Cover Range (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

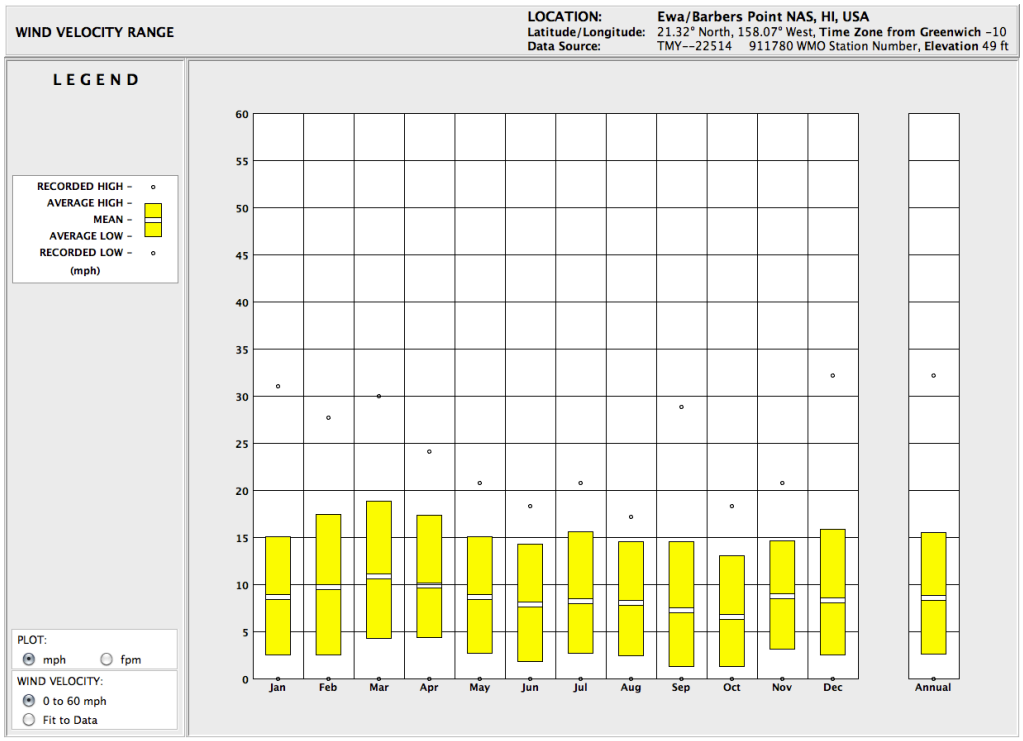

Figure 59. Wind Velocity Range (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

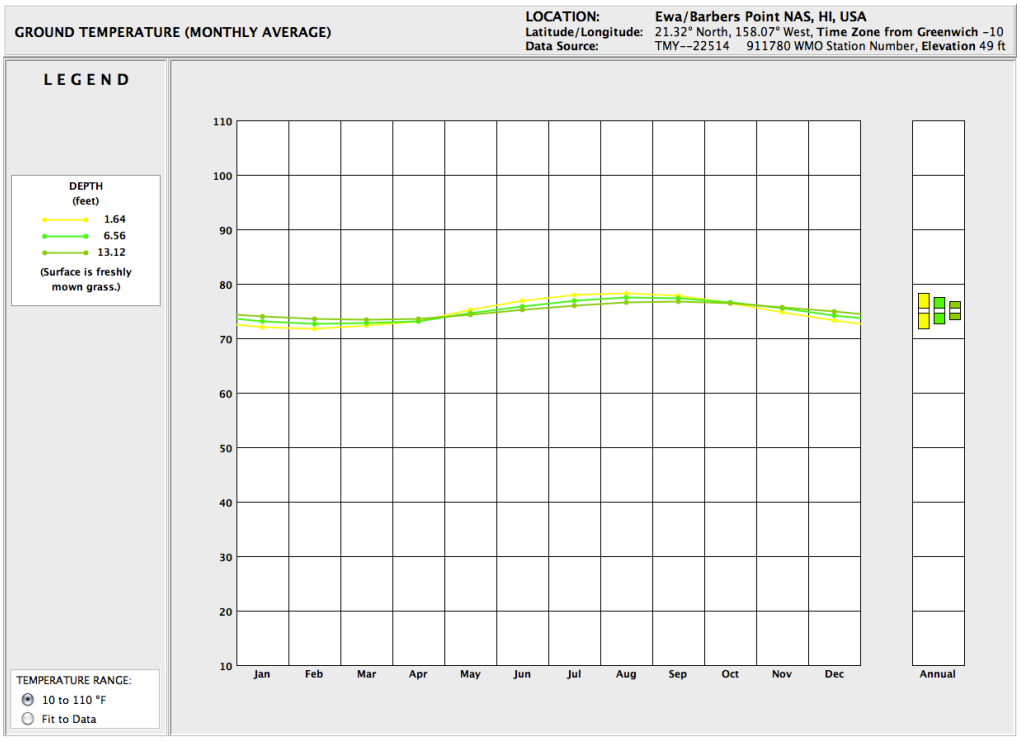

Figure 60. Ground Temperature (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

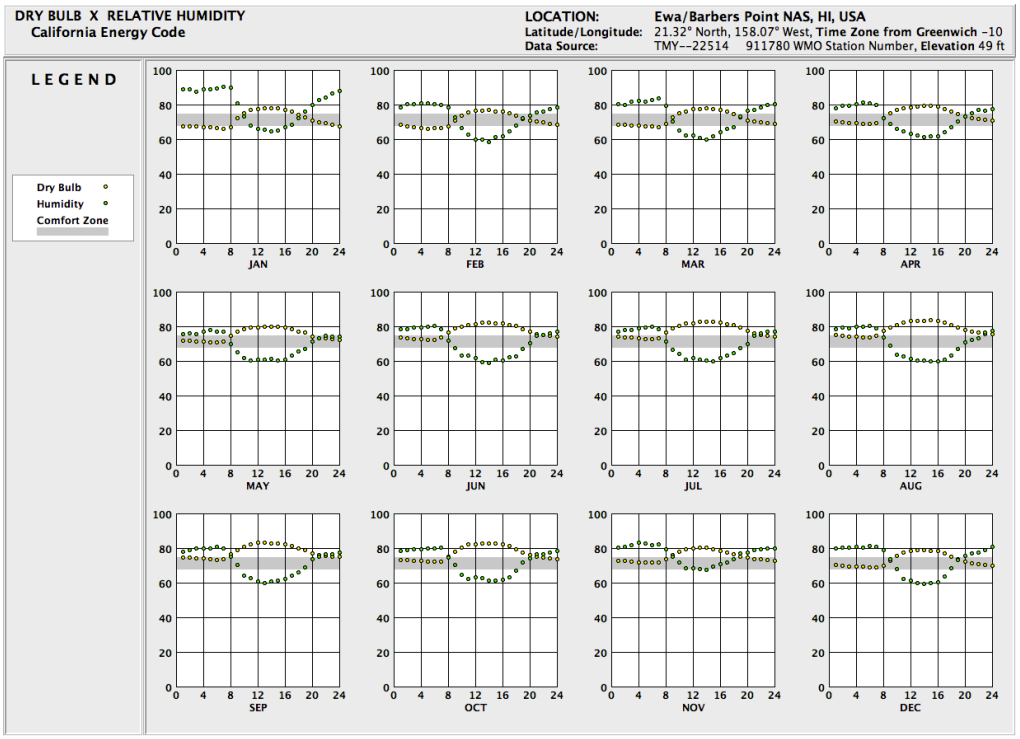

Figure 61. Dry Bulb Temperature x Relative Humidity (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

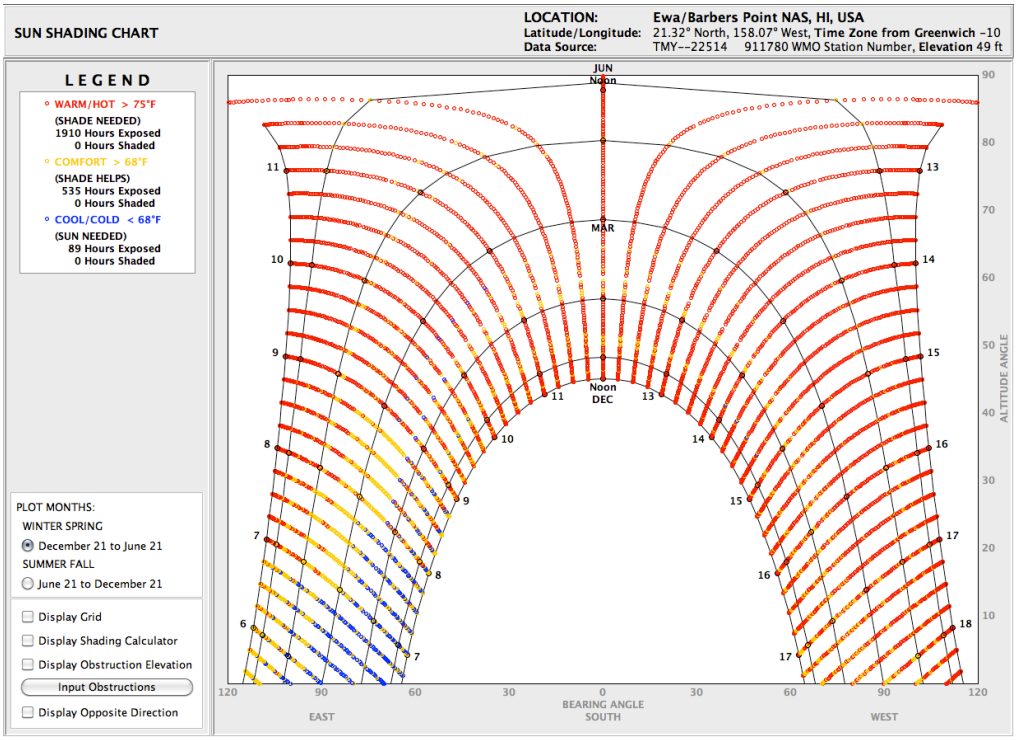

Figure 62. Sun Shading from December-June (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

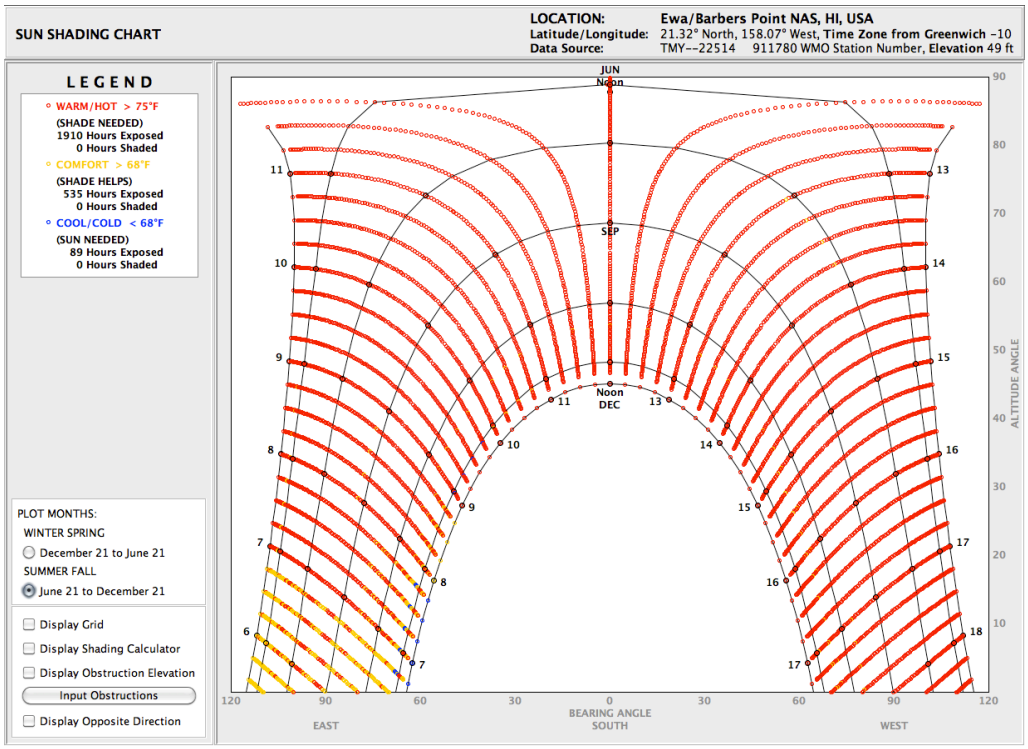

Figure 63. Sun Shading from June-December (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

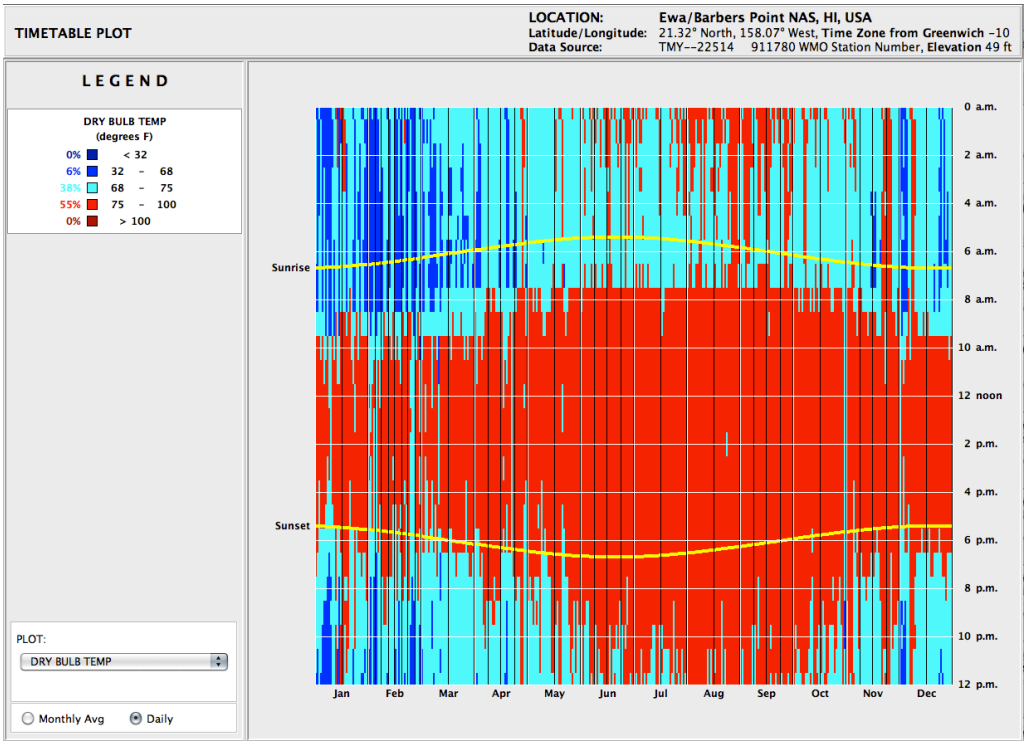

Figure 64: Sun Location (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

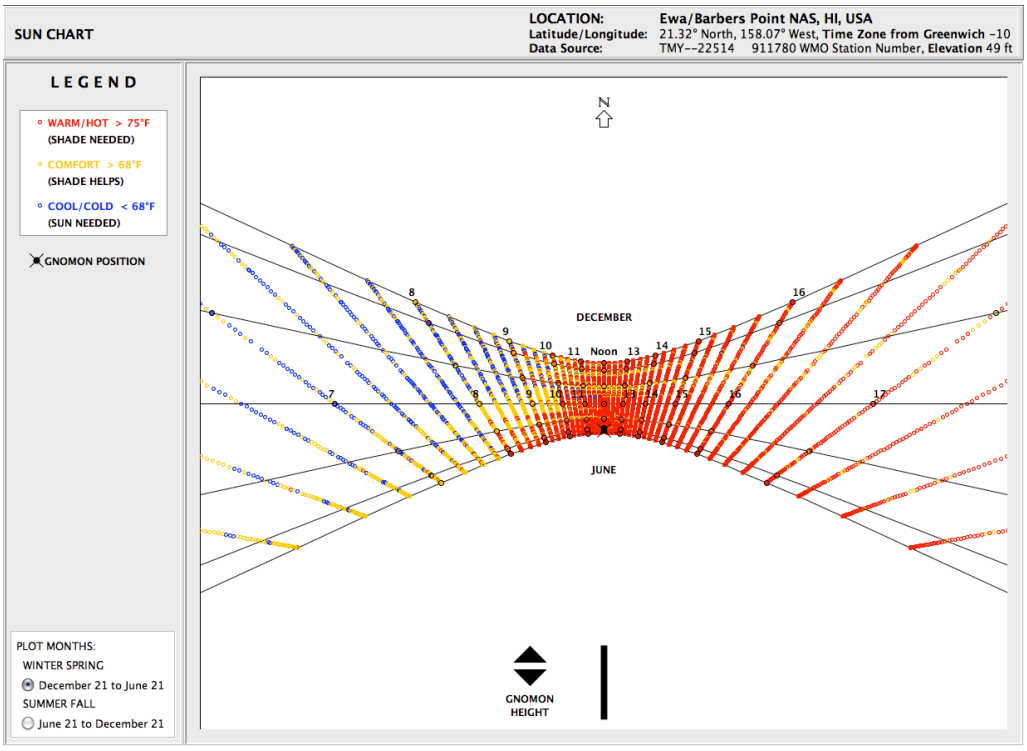

Figure 65. Daily Dry Bulb Temperature (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

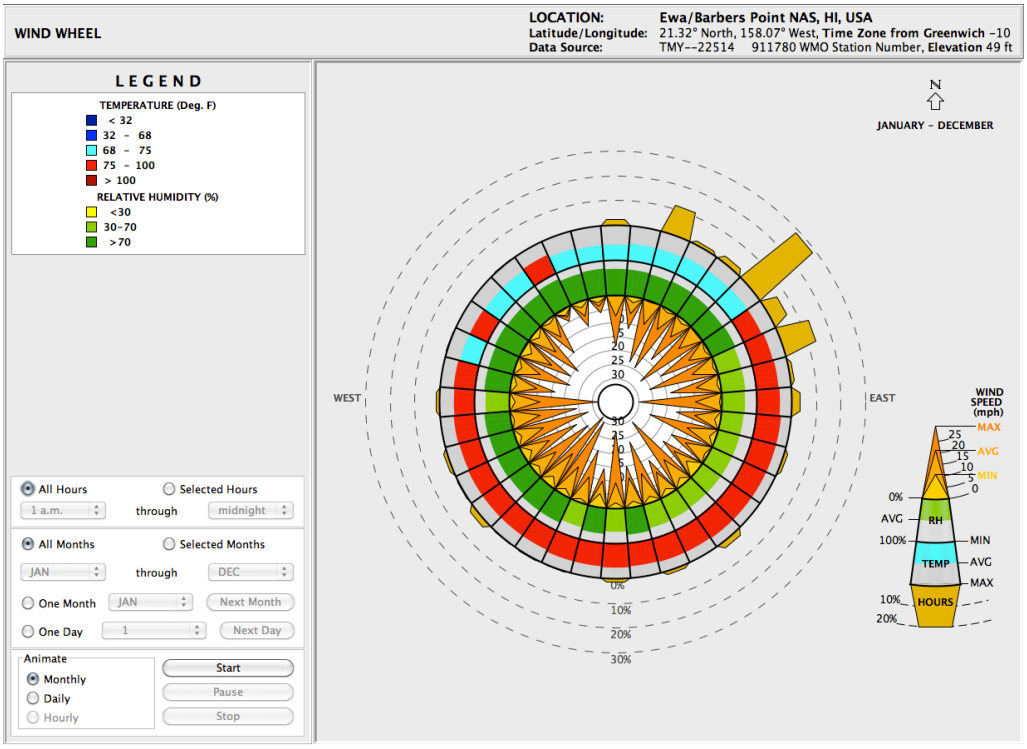

Figure 66. Wind Speed and Direction (nearest O‘ahu weather station) (UCLA, *Climate Consultant 5.5 Beta*.)

Figure 67. Approach to existing O & M building (Ashley Road) (CH2M Hill, *Makai Interconnection Facility Corridor at Ashley Road, view to the west*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, Appendix B, 23, figure 26.)

Figure 68. Approach to existing O & M building (Ashley Road) (CH2M Hill, *Ashley Road Corridor, middle section, view to the southwest*, from *Kawailoa Wind Farm Project: Final Environmental Impact Statement*, Appendix B, 23, figure 25.)

Figure 69. Aerial view of existing O & M building (Ashley Road) (Russ Klettke, "Harnessing Hawai'i's Trade Winds," *GB&D Magazine* January/February 2014, accessed March 28, 2015, http://gbdmagazine.com/2013/25-arita-poulson/.

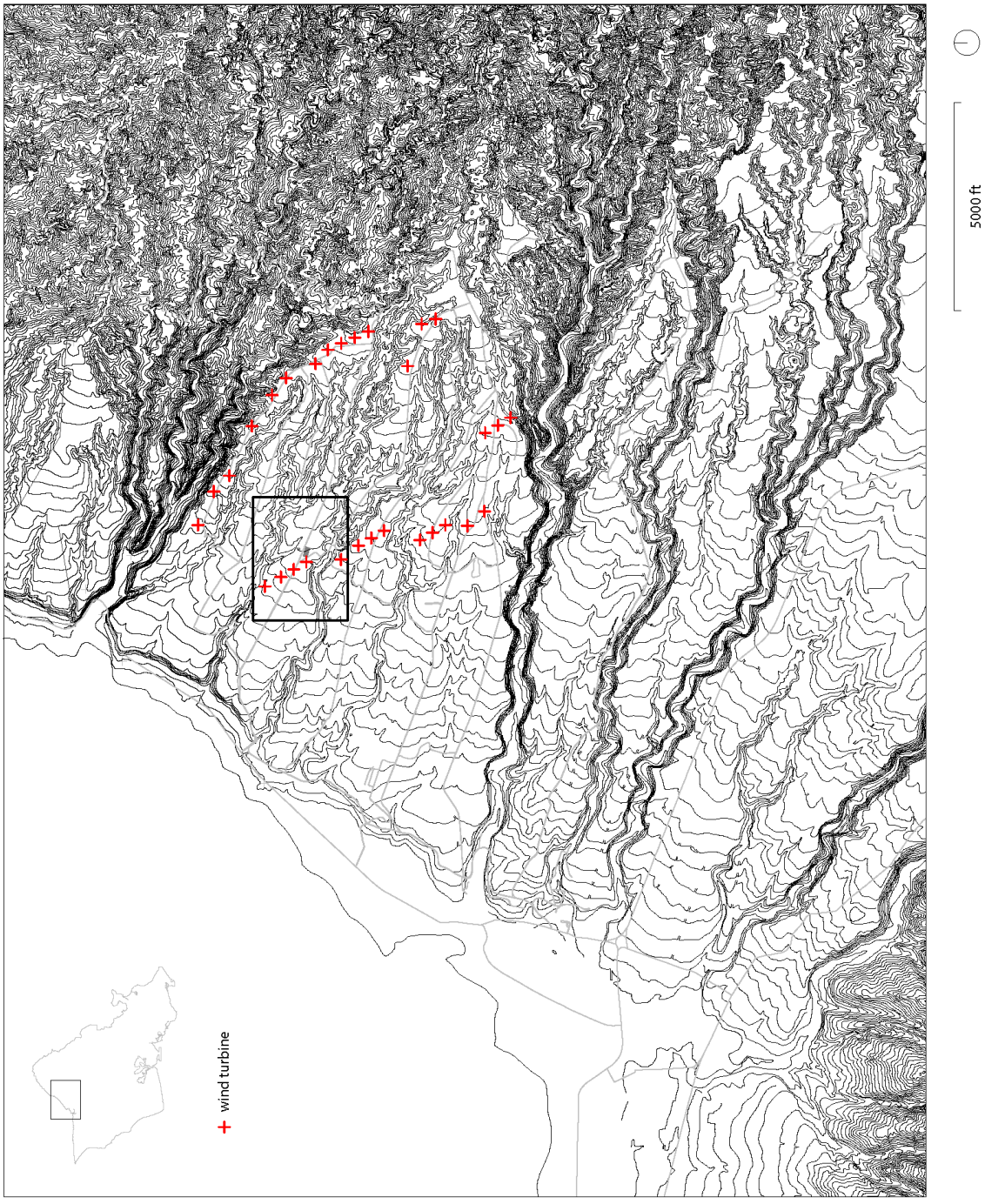

Figure 70. Site topography (20 ft intervals)

6.5 Planning and Programming

Although the wind farm company (First Wind LLC) has not publicly announced plans to construct a visitor center within the site, the project's final environmental impact statement documents its intention to support educational and cultural activities on numerous occasions. One instance of this intention can be found in the project's cultural impact statement where it is stated that:

> According to First Wind, although the project cannot be implemented in a way that entirely avoids all potential cultural impacts, particularly those related to visual impacts, First Wind's goal is to develop and operate the project in a way that is respectful to Hawai'i's unique cultural and natural resources while also contributing to the local community where the project is located, so as to balance any perceived negative effects. [50]

Furthermore, the project is considered a part of two master plans established by the city and county of Honolulu and the landowners (Kamehameha Schools), which aim to foster educational and cultural activities in the area. These plans are known as the North Shore Sustainable Community Plan (2000)[51] and the Kamehameha Schools Strategic Plan (2000 to 2015)[52] respectively. Based on First Wind's agreement to support educational and cultural activities, as well as contribute to the goals specified in the two master planning documents, a planning strategy, basic program, and other design parameters have been for the set for the conceptual project and are as follows:

Planning

Given such discussions of First Wind's intention of 'supporting educational programs that bring students to Waimea Valley and the wind farm,'[53] this research

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[50] CH2M HILL, First Wind, LLC, and Hawaii. Department of Business, Economic Development and Tourism. *Kawailoa Wind Farm Project: Final Environmental Impact Statement* (Honolulu, Hawai'i: CH2MHILL, 2011), Appendix C, xiii.

[51] Civil Beat. "City and County of Honolulu North Shore Sustainable Communities Plan." Last modified February 16, 2011, http://www.slideshare.net/civilbeat/north-shore-sustainable-communities-plan-cd1.

[52] Kamehameha Schools. "Kamehameha Schools Mission and Strategic Plan." Last modified 2011, http://www.ksbe.edu/_assets/spi/pdfs/publications/EntireDocument.pdf.

[53] Wren Wescoatt to Clyde Namuo, June 20, 2011. In *Kawailoa Wind Farm Project: Final Environmental Impact Statement* (Honolulu, Hawai'i: CH2MHILL, 2011), Appendix F.

proposes the locating of a visitor interpretation center in a setting within the boundaries of the Kawailoa Wind Farm that enables visitors to best experience the physical and cultural properties of the site, including the strong winds which are the cause for the wind farm's location in the valley. First Wind has agreed to provide access for traditional activities such as hiking, hunting, gathering, and cultural practices,[54] so it is suggestible that the visitor interpretation center also provides a public infrastructure for individuals engaging in such activities and that it be sited in a way that it is appropriate for such use.

Depicted in figure 71 is the location of the proposed buildings. The reasons for selecting this specific location are driven mainly by its proximity to the existing operations and maintenance building, water cistern, and switch station, as well as its location along Ashley road. The hope is that the design of the visitor interpretation center can take advantage of those existing facilities as well as allow visitors to engage with the facilities necessary to operate the wind farm. The proposed site is also amongst a cluster of wind turbines and within a relatively flat area on Kawailoa. Finally, with the intention of serving as a visitor interpretation center as well as a public infrastructure for traditional activities, the location is not so far into the uplands of Kawailoa to prevent accessibility, yet still takes advantage of a relatively high elevation above sea level (~575 ft.).

Programming

Given the goal of an interpretation center to disseminate knowledge about the natural environment, culture, heritage, or other site-specific phenomena,[55] the program for the project will consist of a group of pavilions that best enable such an experience. Because of the remote location of the project, these pavilions will be low maintenance and designed as a lookout or rest stop area along the access road.

[54] CH2M HILL, First Wind, LLC, and Hawaii. Department of Business, Economic Development and Tourism. *Kawailoa Wind Farm Project: Final Environmental Impact Statement* (Honolulu, Hawai'i: CH2MHILL, 2011), Appendix C, xi.

[55] Pere Izquierdo Tugas, Juan Tresserras, Jordi Matamala Mellin and Juan Carlos, *Heritage Interpretation Centres, The Hicira Handbook* (Barcelona: Diputacio de Barcelona), 31-32.

Key elements of North Shore Sustainable Community Plan [56]

North Shore Sustainable Community Plan (2000):

1. Maintain the community growth boundary to protect agriculture, open space, and natural resources
2. Promote a diversified agricultural industry
3. Enhance the region's recreational and educational potential
4. Promote Hale'iwa and Waialua towns as "country towns"
5. Support Waialua as the north shore's industrial center
6. Direct new housing to areas contiguous to Hale'iwa and Waialua towns and rural design guidelines for rural residential development
7. Provide adequate public infrastructure, facilities, and services
8. Preserve and protect cultural and historic resources
9. Adapt the *ahupua'a* concept as a framework for land use and natural resources management
10. Integrate principles of sustainability into decision-making processes

Key elements of Kamehameha Schools Strategic Plan [57]

Kamehameha Schools Strategic Plan (2000-2015):

1. Provide and facilitate a wide range of integrated, quality educational programs and services to serve more people of Hawaiian ancestry
2. Work with families and communities in their efforts to meet the educational needs of people of Hawaiian ancestry
3. Cultivate, nurture, perpetuate and practice 'Ike Hawai'i (which includes Hawaiian culture, values, history, language, oral traditions, literature, and wahipana – significant cultural or historical places – etc.)
4. Foster the development of leaders who focus on service to others
5. Optimize the value and use of current financial and nonfinancial resources and actively seek and develop new resources
6. Malama I ka 'aina: practice ethical, prudent and culturally appropriate stewardship of land and resources
7. Continue to develop as a dynamic, nurturing, learning community

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[56] Civil Beat. "City and County of Honolulu North Shore Sustainable Communities Plan." Last modified February 16, 2011, http://www.slideshare.net/civilbeat/north-shore-sustainable-communities-plan-cd1.

[57] Kamehameha Schools. "Kamehameha Schools Mission and Strategic Plan." Last modified 2011, http://www.ksbe.edu/_assets/spi/pdfs/publications/EntireDocument.pdf.

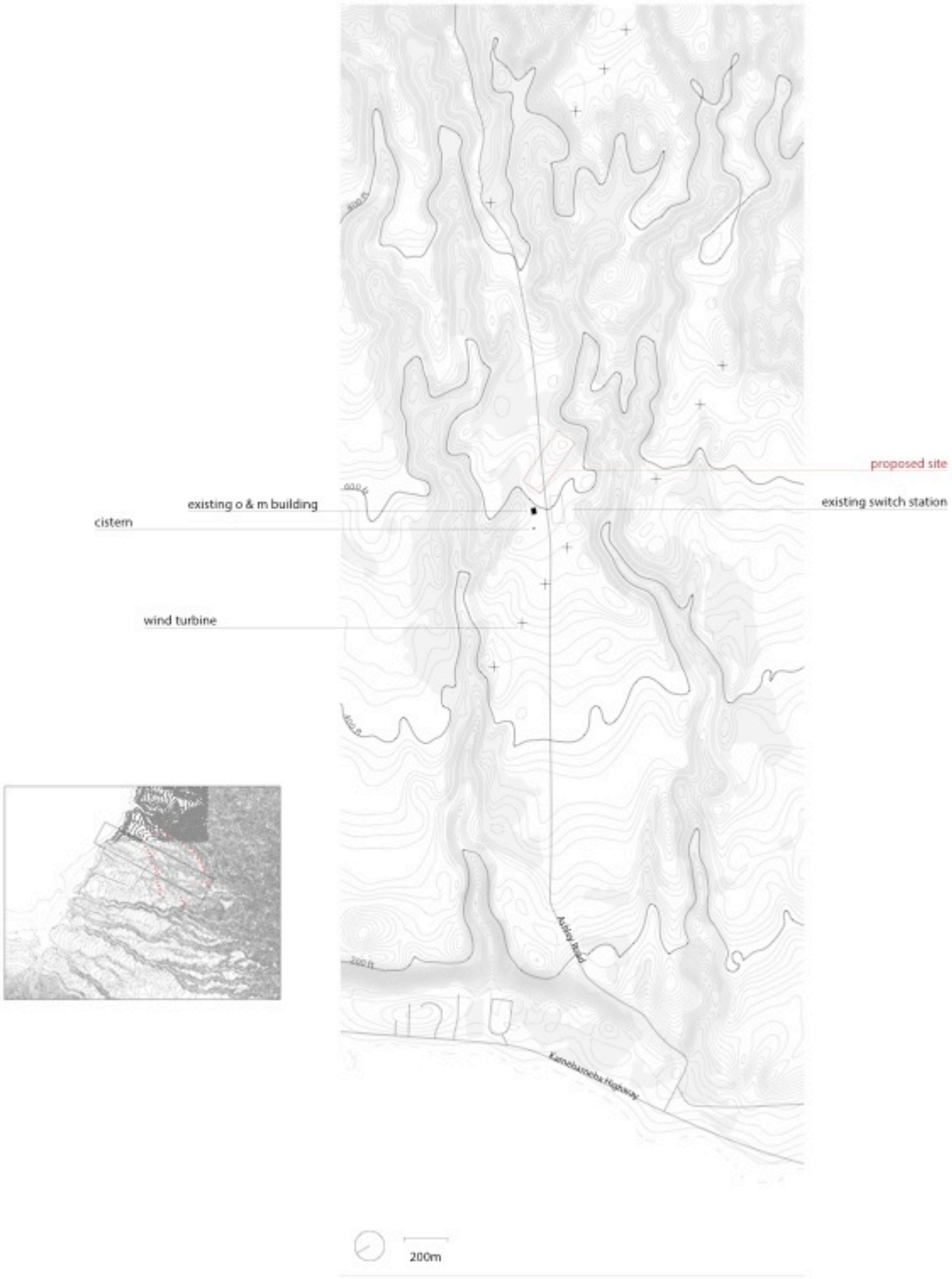

Figure 71. Proposed Site Location

6.6 Design Concept

Given the analysis of the physical and cultural context of the visitor intepretation center in section 6.3 and 6.4, as well as the planning and program parameters set in section 6.5, the the creation of a space that is perceived as 'floating' or 'hovering' over the landscape has been selected as the design concept for this project. Before explaining the specific way in which this concept will be executed through the mechanism of pattern, a description of the logic of its application to the visitor interpretation eenter and a history of its execution in archtiecture and design will be discussed.

Figure 72. Scene from *Castle in the Sky*, 1986 (Castle in the Sky, directed by Hayao Miyazaki, (1986; Disney Presents Studio Ghibli), DVD.)

Reasoning and Applicability

The nature of the concept of a floating space makes sense given the physical context of the vistor's center because it could likely take advantage of the 200 to 1,280 feet above sea level elevation by maximizing views and opportunities for natural ventilation. As shown in the previous research of the physical site, there are numerous visual resources such as Waimea Bay, Chun's Reed, Lanniakea, Pua'ena Point, and Haleiwa Beach. Shown in figures 52 and 53 windspeed and wind power density in the area of the site increase with elevation. Any sort of significant elevation of a space above the landscape takes further advantage of these valuable site resources.

Given the program of the project as one that aims to educate visitors about the natural power of the winds at Kawailoa and wind power technology itself, the concept of a floating space creates an opportunity for users to receive such an educational experience in a highly perceptual way. Diferent from common vistor center activities

such as exhibitions, films, and visual media, a space is proposed that puts users in direct contact with the natural surroundings, including the winds. By making the perceptual experience of higher elevations the educational expereince itself, the project has the potential to achieve its goals as as a form of interpretation center [58] where in which dissemination of knowledge about the natural environment, culture, heritage, or other site-specific phenomena is achieved directly through crafting one's physical relationship to the site. In other words, the visitor's engagement with architecture becomes the exhibition.

Figure 73. Proximity with sky/clouds at Kawailoa wind farm ("Kawailoa Wind Media," First Wind, accessed Februrary 27, 2015, http://firstwind2013.graphikdev.com/projects/kawailoa/.)

In regards to the cultural context of the visitor interpretation center which is highly critical to the success of the project, the concept of a floating space is a logical way of achieving an architecture that is critical of both the micro and macro components (Kawailoa and Hawai'i) of the site's genius loci. As shown in analysis of the physical context as well as in the above photos, the immediate site is in close proximity to the clouds because of its high elevation. Moreover, the uplands of Kawailoa lead to the highest point on O'ahu, Mount Ka'ala. It is at such high elevations on O'ahu that one can literally be within the clouds. To create a space where one perceives that he or she is floating or defying gravity in some sense is to embody that peculiar and unique atmosphere of Kawailoa.

History/Background

The endeavor to create architecture that perceivably 'hovers' or 'floats' above the

[58] Pere Izquierdo Tugas, Juan Tresserras, Jordi Matamala Mellin and Juan Carlos, *Heritage Interpretation Centres, The Hicira Handbook* (Barcelona: Diputacio de Barcelona), 31-32.

landscape is a design concept that has intrigued architects and been the inspiration of numerous siginificant works of architecture througout history. It is a novel idea that has not only led to an element of delight in architecture, but has also had serious practical value in its pointing towards innovative ways of how space can be conceived, occupied, and constructed.

In observing architectural projects throughout history, it can be seen how working towards the impossibility of the idea of a floating volume has led to innovative contributions to architecture. Instance of this outcome can be observed in projects such as Villa Savoye (Le Corbusier, 1931), Sky House (Koyonori Kikutake, 1958), the Sammlung Goetz Museum (Herzog and DeMeuron, 1992) and the Blur Building (Diller and Scofidio, 2001). Together these projects represent a catalog of ways that the concept of the floating volume has been pursued over the last eight centuries. The following is a brief description and analysis of each pursuit.

Villa Savoye is a well-known icon of the architectural discipline located in Paris and designed by Le Corbusier in 1929. The work embodies Corbusier's idea of house as 'A Machine for Living' and had significant influence to what became known as the 'International Style.' Corbusier's Five points Towards a New architecture are all present in the work and include supporting structure or pilotis, a flat roof terrace, the elimination of loadbearing walls to enable a free plan, horizantal ribbon windows, and a non-loadbearing façade. The project sits in a grassy meadow located outside a small village and is surrounded by trees.

Figure 74. Villa Savoye, Le Corbusier, 1931 (Flavio Bragaia, *AD Classics: Villa Savoye/Le Corbusier*, digital image, Archdaily. Accessed March 28, 2015. <http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier/>)

The deisgn of Villa Savoye achieves the perception of a floating volume by use of thin, evenly spaced piloti located just inside the permeter of volume they support. While it is a simple idea, the structural composition was carried into many modrnist projects that followed in its footseteps. In an article published in Australian Design Review, Michael Holt points out that the design of the villa as well as Corbusier's five principles was what influenced one of most well kown metabolist projects known as the Sky House.[59]

Figure 75. Sky House, Kiyonori Kikutake, 1958 (Flavio Bragaia, *AD Classics: Villa Savoye/Le Corbusier*, 2010, digital image, Archdaily. Accessed March 28, 2015. < http://www.archdaily.com/477882/le-corbusier-model-for-the-metabolists/>)

Sky House is a single-family residence located in Japan designed by Koyonori Kikutake in 1958. Like Villa Savoye, Sky House is also a project that is identified for its representing a significant movement in architecture. Known for embodying principles of the Metabolist agenda, Sky House was designed to allow for flexible inhabitation of space through Kikutake's 'movenette system.'

As Michael Holt identifies, evidence that Kikutake used Villa Savoye as a precedent for its design can be seen in Sky House's use of Corbusier's five points. However, critical to the current investigation is the article's explanation that both building's achieved a floating volume in a slightly different way. Instead of executing

[59] Holt, Michael, "The Meeting of East and West: Kikutake and Le Corbusier," *Australian Design Review*, November 15, 2013, accessed March 23, 2015, http://www.australiandesignreview.com/features/36553-on-trial-the-meeting-of-east-and-west-kikutake-and-le-corbusier.

the concept using thin, evenly spaced piloti placed just within the perimeter of an overhead volume, the project achieved it through the 'hanging' volume. In an article that explores Kikutake's use of the hanging volume to achieve 'floating worlds' in metabolist architecture, Coydon Ireland points out that the hanging system initiated in the design of Sky House would lead to projects such as Hotel Tokoen (1964).[60] It is in this eight-story building that Kikutake would create a tree like mega structure from which he would suspend the fifth and sixth floors of the hotel.

Figure 76. Sammlung Goetz Museum, Herzog and De Meuron,1992 (Wilfred Petzi, *Sammlung Goetz Munich/Herzog & de Meuron*, digital image, Archdaily. Accessed March 28, 2015. <http://www.archdaily.com/211932/sammlung-goetz-munich-herzog-de-meuron/>)

The Sammlung Goetz Museum is a private museum located in Germany designed by architects Jacques Herzog and Pierre De Meuron in 1992. The sunken two-story gallery is one of the earliest projects of the contemporary architects who are identified for using a conceptual and phenomenological approach. In a public discussion between Jacques Herzog and Peter Eisenman in 2007, Herzog stated the following about the nature of their work: 'Its conceptual because it's held together with thinking; with concepts of thinking. It's highly theoretical and conceptual.'[61]

It his explanation of the building's concept, Herzog states that the intention of the building was to create a 'non-hierarchical,' 'blurred architecture,' in which the experience is 'the same above as it is below.' He explains that this is achieved in two

[60] Corydon Ireland, "Future Man," *Harvard Gazette*, October 3, 2012, accessed March 23, 2015, http://news.harvard.edu/gazette/story/2012/10/future-man/.

[61] Jacques Herzog and Peter Eisenman, "Dialogue: Jacques Herzog and Peter Eisenman" (lecture, Harvard GSD, Boston, MA, December, 4, 2007).

ways. The first is by duplicating the same experience of opacity and natural lighting in the both stories, but using the ground plane to create opacity in the lower story and an opaque façade to create it in the upper story. Secondly, the similar yet different material qualities of birch plywood and semi-translucent glass are intended to create an 'almost homogeneous and opaque building.'[62] Karen Cilento quotes Herzog on one occasion stating that "Depending on the daylight conditions and the point of view of the observer, the gallery appears either as a closed, flush volume consisting of related materials (birch plywood, matt glass, untreated aluminum) or as a wooden box, resting on two trowels in the garden." [63] While Herzog does mention directly in this lecture that he intended to create the perception of a floating volume, he identifies in a later lecture that the gallery would inform the designs of the Tate Modern and Elbe Philharmonic. Both of these adaptive reuse projects would place translucent volumes over monolithic opaque structures.

The Blur Building is a pavilion located in Switzerland, designed by architects Elizabeth Diller and Ricardo Sofidio in 2001. The structure was designed for the 2002 Swiss National Expo. It consists of a 60m x 100m x 20m skeletal structure that sprays tiny drops of water from the lake beneath, through 31,400 high-pressure jets with 120-micron apertures. Because of the small aperture and high size and pressure of the jets, most of the droplets of water (4 to 10 microns in diameter) remain suspended in the air, literally forming a cloud that engulfs the platform.

[62] Jacques Herzog, "Herzog & de Meuron: Myths and Collaborations over Time" (lecture, Columbia GSAPP, New York, September 9, 2013).

[63] Karen Cliento, "Sammlung Goetz Munich/Herzog & de Meuron," *Archdaily*, February 27, 2012, accessed March 26, 2015, http://www.archdaily.com/211932/sammlung-goetz-munich-herzog-de-meuron/

Figure 77. Blur Building, Diller and Scofidio, 2001 (Archdaily. *Think Space: 'Look what Carles Renfro of DS+R has to say on Blur Building project after a decade or so*, digital image, Archdaily. Accessed March 28, 2015. <http://www.archdaily.com/239669/think-space-look-what-charles-renfro-of-dsr-has-to-say-on-blur-building-project-after-a-decade-or-so-competition/>)

Not necessitating explanation, the building achieves the perception of a floating volume in a highly literal way. The project pushes the boundaries of what can still be defined as architecture in its use of water vapor as a building envelope. The firm states their focus as being as much about defining the nature of space as it is about the creation of space.

The group of projects shows various ways in which the concept of the floating space has been achieved in the past. Figure 78 analyzes the differences in the methods used in a way that breaks the ideas down to their basic elements. The top figure demonstrates the pure execution of concept where in which a volume defies gravity. Depicted below the ideal (from top down) is the perching of the volume above thin pilotis located just within the edge of the volume (Villa Savoye), the hanging of volume within pilotis (Sky House), the elimination of the hierarchy of a volume relative to the ground plane (Sammlung Goetz), and finally the literal dematerialization and suspension of the building envelope in mid air using water vapor (Blur Building). Upon completion of the design the visitor interpretation center, these examples will serve as a basis on which this project's execution of the concept of the floating space will be compared and evaluated.

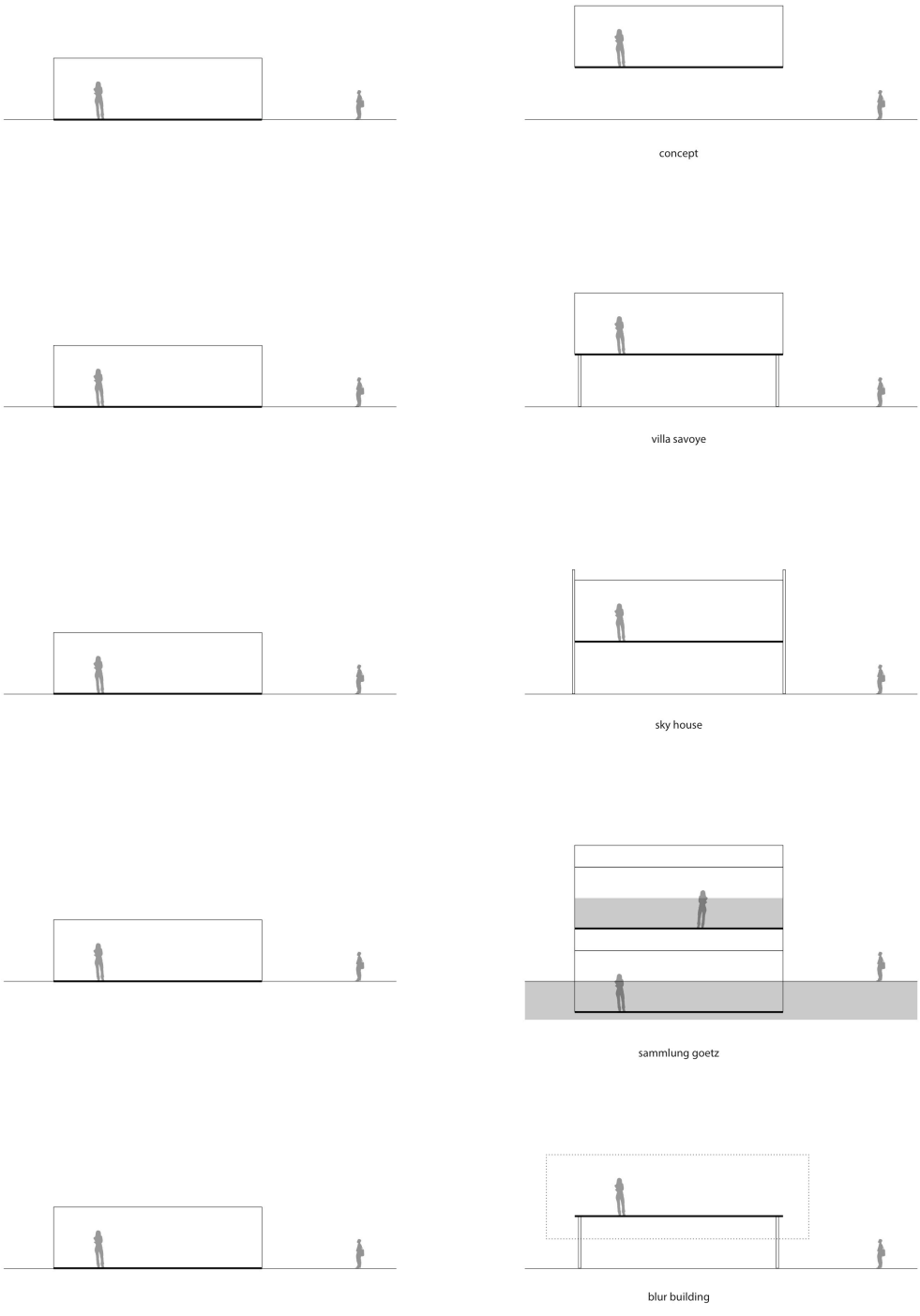

Figure 78. Existing forms of concept execution

6.7 Design Concept Execution

Through architectural design, the mechanism of pattern can enable the perception of a floating space by creating an experience in which one's perception of the ground plane conflicts with that of 'reality.' In addition to using the logic established in chapter 3 as well as answering research questions regarding the applicability of Gregory Bateson's ideas of pattern in architectural design, the following means of achieving perception of the floating space focuses on the goal of exploring notions expressed in section 5.2 regarding the *potential* of pattern as a mechanism in architectural design. This refers especially to the idea that through its simple and archaic quality, the element of redundancy can achieve highly complex or 'advanced' results.

Conflicting Messages of the Location of the Ground Plane

Perhaps one of the simplest, yet significant indications that we are not in a state of floating or hovering above the ground or floor plane is our perception of where it is. Key to this design's execution of the floating space through the mechanism of pattern, is the fact that we perceive the location of the floor beneath us not only directly through our senses (we can see, feel, hear, smell, and taste the ground) but through our perception of the components of architecture. Because there is redundancy in the organization of components that are typically a part of architecture (windows, materials, doors, light, etc.), these components carry a form of localized information about each other, should any happen to be 'missing.' This is synonymous to the idea that Bateson discusses in the nature of English prose (section 2.2). Similar to English prose, one component of architecture may contain more information about another specific component (through redundancy) compared to another. Because it is produced strictly through redundancy, this information is separate of other 'more objective' ways in which we extract meaning from architecture (symbolism, historical references, verbal signage, stylistic components, etc.) For example, the letter 't' may occur more commonly before the letter 'h' compared to the letter 'z,' therefore, the letter 't' carries more information separate about 'h' occurring after it, compared to 'z.' As a result, in specific sentence of English prose in which the letter 'h' is missing, we know 'h' is missing without knowing the verbal meaning of letters and words. According to the previous research the occurrence is

directly translatable to architecture.

Regarding the task of creating conflicting information or messages in the user of a building about the location of the floor plane, this is possible first by understanding what components of architecture are more redundant with information about some in comparison to others. There is of course some subjectivity in establishing this, but at the same time there is a great deal of consistency as well. For example, both a window and a door contain information about 'the outside,' but a window carries more information about it in that we likely look out a window to receive information about the outside more than we go out through a door receive that same information (one reason is that doors are often more opaque than windows and we depend more on vision than hearing to receive information). Furthermore, the opposite would be true if we were discussing the carrying of information about an entrance/exit.

Figure 79. A window carries localized information about the outside through redundancy

It is also possible to think in term of what *combinations* of architectural components contain localized information about others through the redundancy of architecture. For example, when separate, a table and chair carry little information about a space for gathering. However, there are not many other combinations of components in architecture that carry a clearer message about a space being a place for gathering, more than a table and a group of chairs. This is a fairly obvious example, however, a less obvious combination carrying localized information about a gathering space would be 'multiple chairs under a shading device/overhead plane.' Furthermore, it should be noted a chair and table contain redundancy in and of themselves that enable us to receive

localized information about their components if they happen to be ‘missing.’ For example, in the combination in the below image, should the chairs’ backrests be missing, yet still maintain the anthropometric measurements (measurements based on the body) the combination would still deliver a highly objective form of message about a space for gathering.

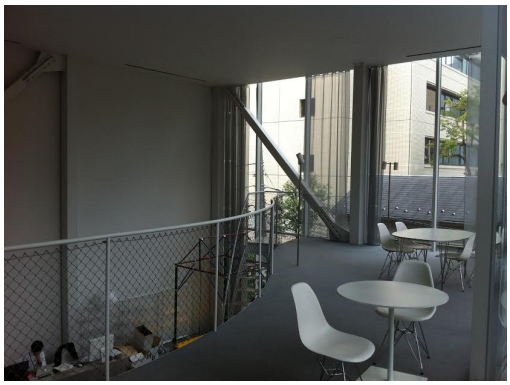

Figure 80. Combinations of components that carry information through redundancy

Given the above explanations, it could be said that individually, and to a much greater extent in combination with each other, a window, balustrade/railing, and overhead plane/ceiling carry localized information about the location of the floor plane (figure a, b, and c in figure 83). When the components appear both individually (a) and to greater extent (indicated by the thickness of the red line) in combination with each other (b and c), we can guess with better than random success that a floor plane will be located not only adjacent to them, but adjacent in a very specific way relative to three dimensions. This is opposed to two-dimensions in a piece of English prose.

Because of the information about the presence and three dimensionally based location of the floor plane carried by the combination of the window, balustrade/railing, and overhead plane/ceiling, the three components create a strong message that can inform, conflict, or be in opposition with other ways we perceive it, including the way enabled by our physical standing on the a floor plane. It is then possible to use this phenomenon to intentionally create messages about the location of the floor plane that conflict with our physical standing on it. Figure d in figure 83 demonstrates this idea. The diagram only shows the entire combination being used to create the conflicting message,

but because each individual component carries information about the floor plane on its own, it is possible that only a window and balustrade could be used to create the message to a lesser extent, or to even lesser extent, only a window. Several more figure d diagrams could be made based on the difference of magnitudes expressed in diagrams a, b, and c.

Figures e and f in figure 83 demonstrates the information carried through about the location of the floor plane in vertically stacked spaces. By its vertically based redundancy in and of itself, a multiple story structure carries information through redundancy about the location of the floor plane in vertical succession. For example, as we move through the floors of a vertical space, we can guess with better than random success about where floor plates will 'occur.'

Figure 81: Localized floor plane location information carried by stacked spaces

Figure e shows the increase in magnitude of the information carried about the location of floor plane in a stacked space as they increase in the amount of stories. This is synonymous to figures a, b, and c. Figure f, demonstrates the ability for the floors/volumes within a stacked space to create conflicting messages about the location of the floor plane through thinking about them as combinations. This is synonymous to the phenomenon explained in figure d.

Finally, figure g in figure 80 attempts to demonstrate the notion that information carried by components of architecture about others through redundancy can be further increased or compounded within a specific architectural experience through strategic design. Expressed in the figure is the idea that the more the combination of a window, balustrade/railing, and overhead plane/ceiling are experienced *within a specific*

architectural experience, the localized information they already contain about the location of the floor plane because of architecture as a 'universe of messages' (as Bateson defines it in section 2.1), is incrementally increased or compounded. The time-based diagram shows that after the window, balustrade/railing, and overhead plane/ceiling combination is experienced in a concentrated and condensed way over time and space (however that is achieved architecturally), the ability for the combination to create conflicting information about the location of the floor plane is in a sense, 'charged.' This is indicated by the increase in thickness of the red notation.

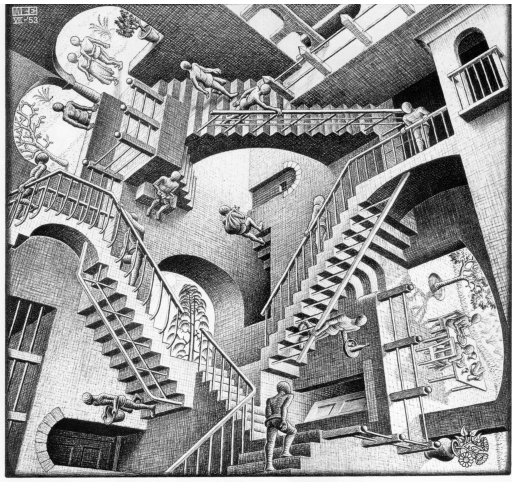

Figure 82: *Relativity*, M.C. Escher (M.C. Escher, *Relativity*, 1953. Print. Official Website of M.C. Escher. Accessed March 29, 2015. <http://www.mcescher.com/gallery/back-in-holland/relativity/>)

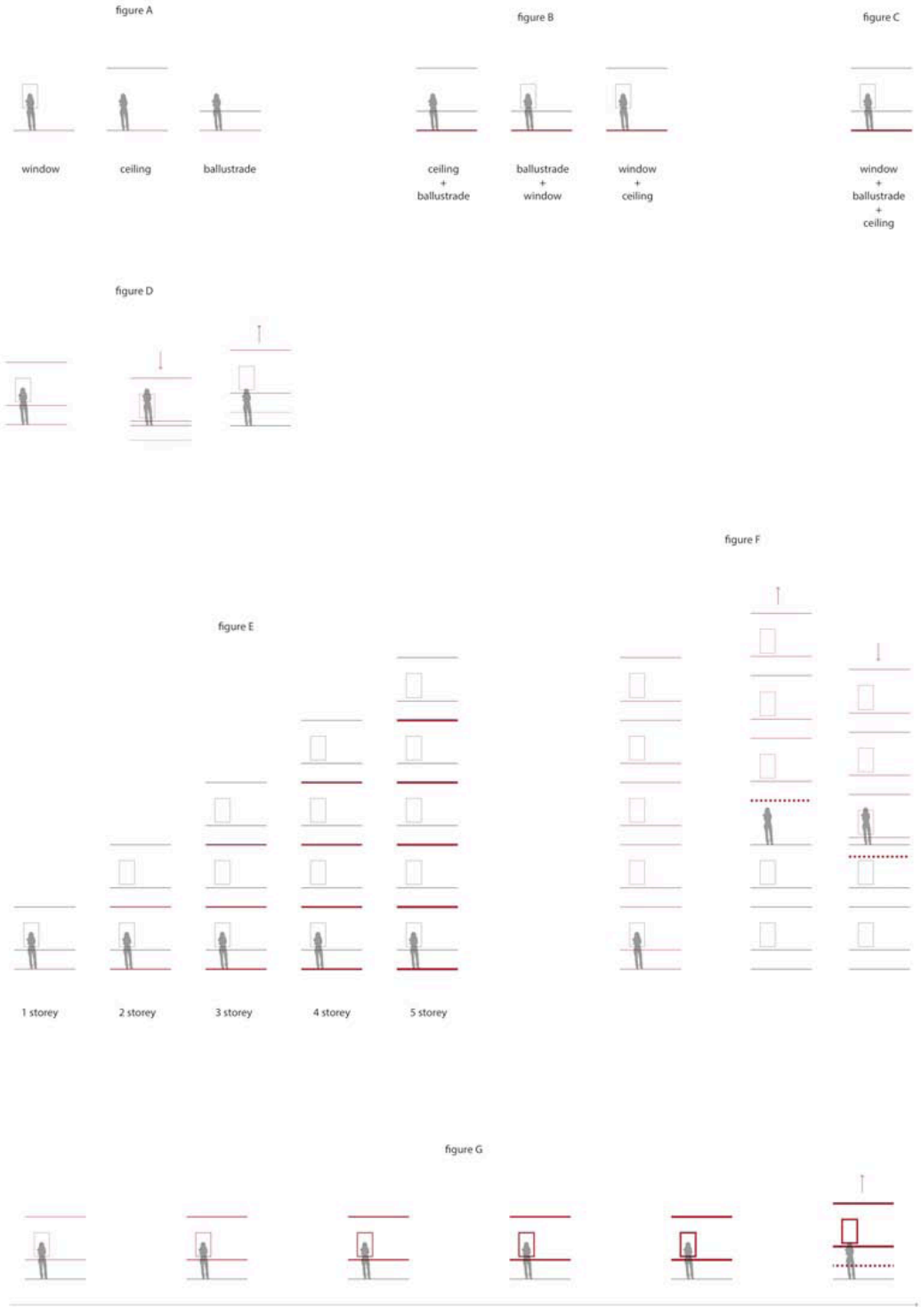

Figure 83. Concept Diagram 1

Water, Sky, and Horizon

Rather than using a window, balustrade/railing, and overhead plane/ceiling enable localized information to be communicated about the location of the ground plane, the design of the proposed visitor interpretation center uses the components of water and sky. This is due to project's context – which in being in a remote and highly abundant location – is highly abundant with these two elements. One might say that water and sky are just as much components of architecture as windows, balustrades/railings, and overhead planes/ceilings.

Figure 84. Location of horizon between water and sky

Like the principles expressed about the three components in figure 80, water and sky carry information about the location of the ground plane both individually and to a greater extent, in combination with each other. Furthermore, the more of each that are experienced in a closed system, the stronger the messages about the ground plane that are produced from their redundancy. This notion is expressed in the above figure 81 and in diagram a in figure 82. Especially indicative of the validity in the idea can be seen in the fact that in many occasions throughout time and space, we use water, sky, or a combination of the two to 'locate' ourselves, or gain awareness of our position in a place.

Given the significant objective information carried by water and sky about the location of the ground plane through redundancy, it is possible to use these two elements to a great extent individually as a means of perceiving a space that floats relative to the 'true' ground plane. This is so long as both sky and water are present in a redundant, closed system where one can be perceived or coded in relation the other. This is expressed in diagrams b, c, and d in figure 82.

Figures 85 through 96 express the redundant, closed system that can be crafted through architecture in order to create perception of a floating space using water and sky. Using the terminology established in section 3.2, this could be considered a 'premise for coding.' All components of the project including topography, existing buildings, use, circulation, and building forms are rigorously integrated into this system. The imaginary sphere and grid that encompasses the project depicted in figure 86 corresponds directly to figure 85 in that the sphere itself represents diagram a, space a represents diagram b, and space b and c represent diagram c and d respectively. Using the same method of diagrammatic analysis used in chapter 4 case studies, figure 87 expresses the element of pattern or patterning embedded in the project in order to achieve perception of a floating space. The graphic shows that redundancy is not only introduced to the context through new building forms and spatial dimensions, but is also recognized in the existing context and used as a means of creating a relationship between them. Unlike, case studies analyzed in chapter 4, the process of coding through redundancy and noise is used on many levels throughout the design including the relationship between water, sky and horizon, the relationship between space a and the existing context, and the relationships between space b and c with space a.

It is important to note that while water and sky carry information about the location of the ground plane through redundancy, a means by which the significant presence of two can be perceived or 'carried into' built spaces is necessary. For space b, this meant the design of a space with accommodations for experiencing the sky on an intimate level. Angled seating and completely horizontal platforms centralized around the opening to the sky were used (figure 90 and 93). For space c, the presence water is achieved by using monolithic structural support of a large volume of water, the enabling of visitors to come in direct contact with the structure, and a glazed opening at the bottom of the water's vessel (figure 91 and 95). Acting as a space that mediates between the existing conditions and spaces b and c, space a achieves a presence of both sky and water using similar yet scaled back methods employed by spaces b and c (figure 89 and 92).

Regarding the function of the visitor's center as a means of providing education, the design acts a form of interpretive center, disseminating knowledge of the site through direct experience. The primary way in which it does so is through a heightened sensorial

experience of the physical site – the experience of floating in relation to it. In addition to providing visitors with the ability to experience the site's proximity with the clouds, it could be said that users can experience the site from a similar perspective of *being within a cloud*. Furthermore, the design is intended to become a space that is literally an extension of the site, rather than addition to it – for example, a special rest stop or lookout along a trail leading to the uplands of Kawailoa (figure 96).

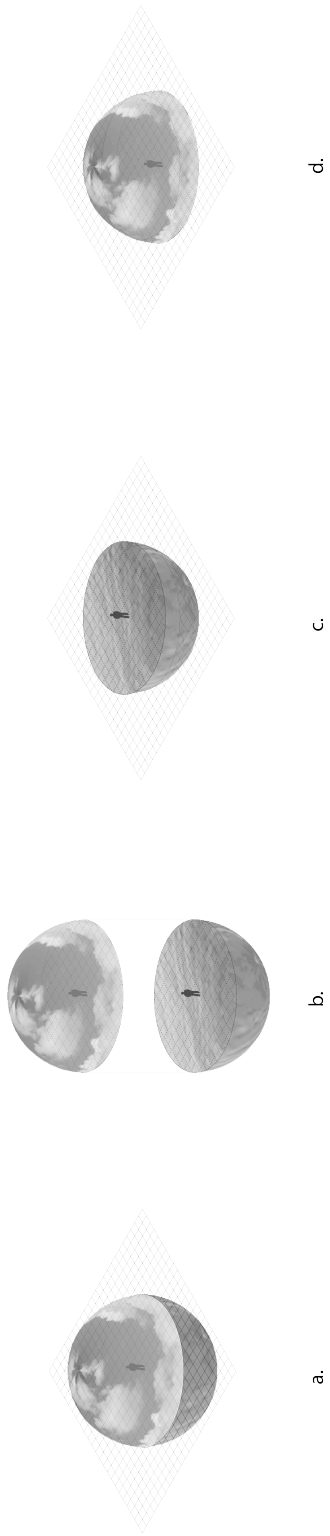

Figure 85. Concept Diagram 2

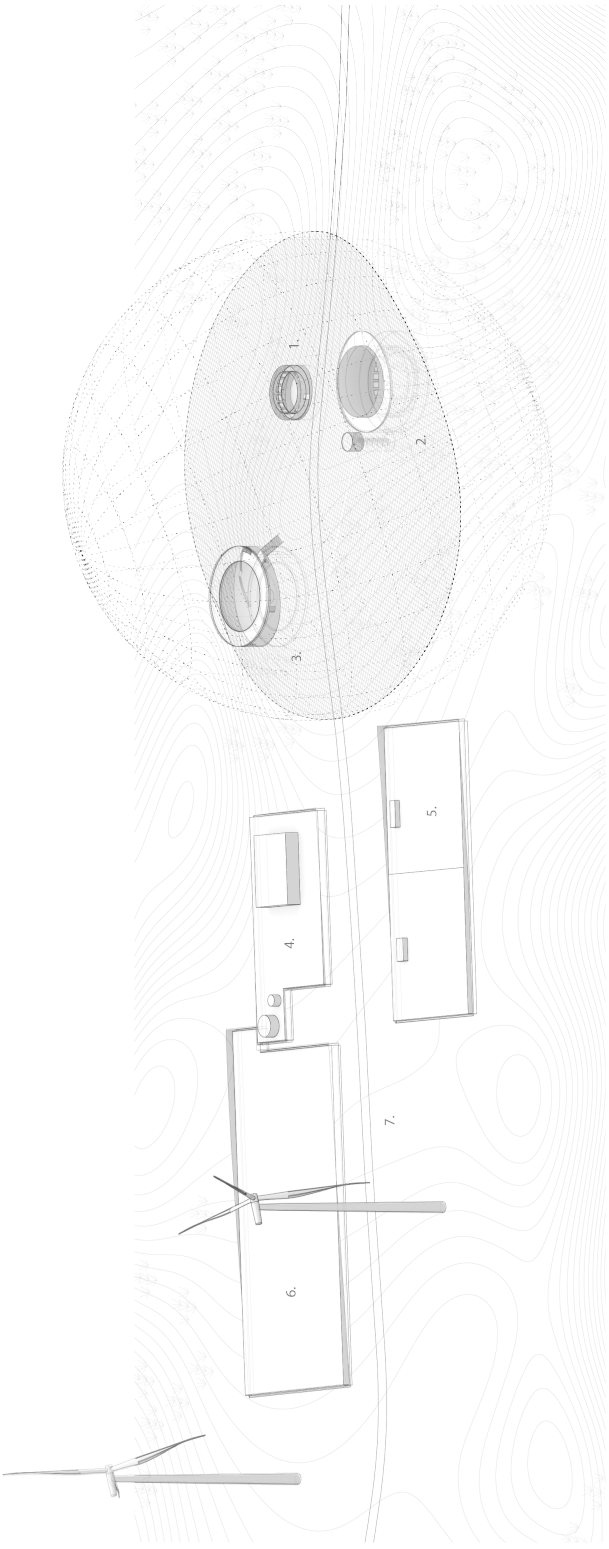

Figure 86. Site isometric

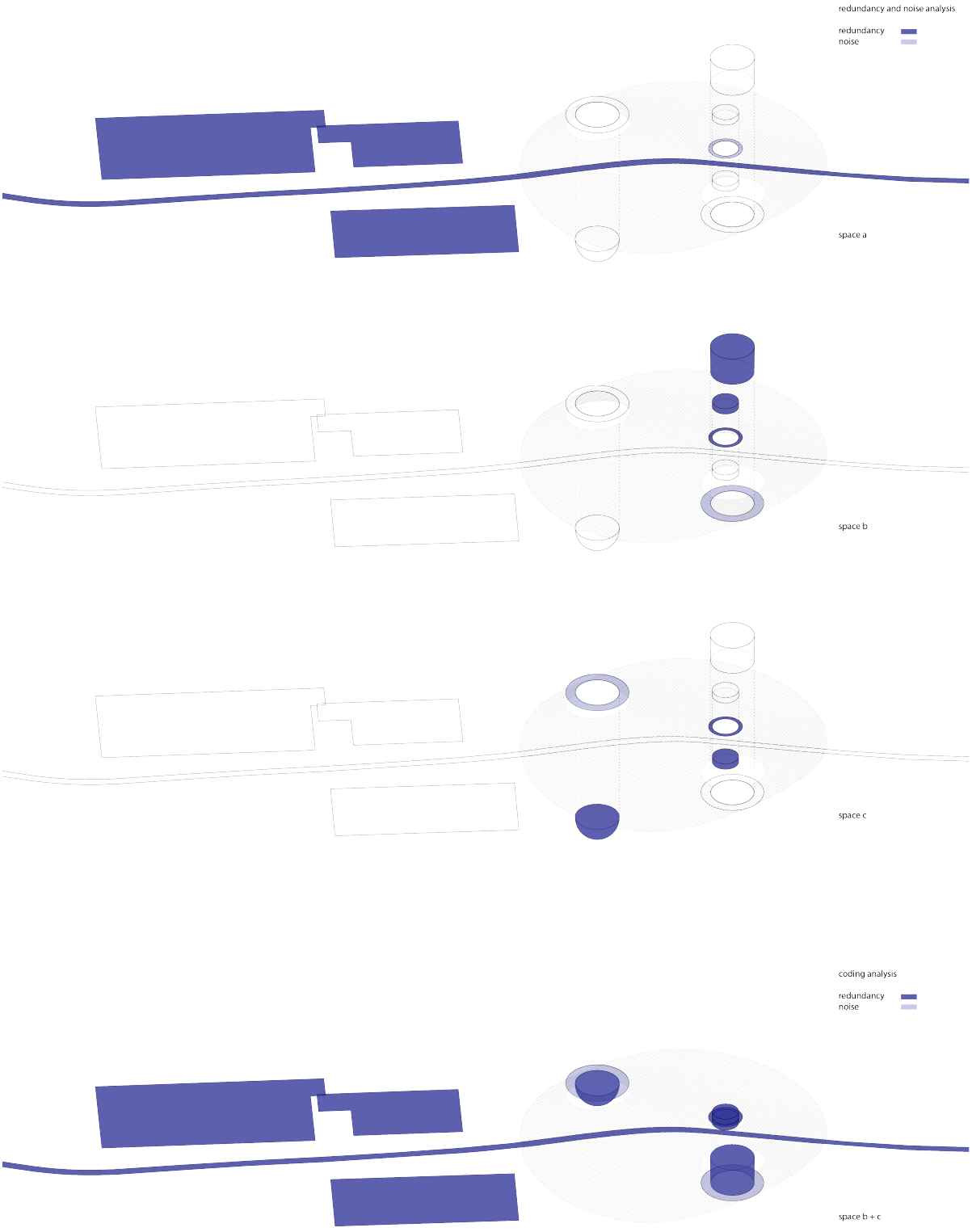

Figure 87. Redundancy, noise, and coding analysis

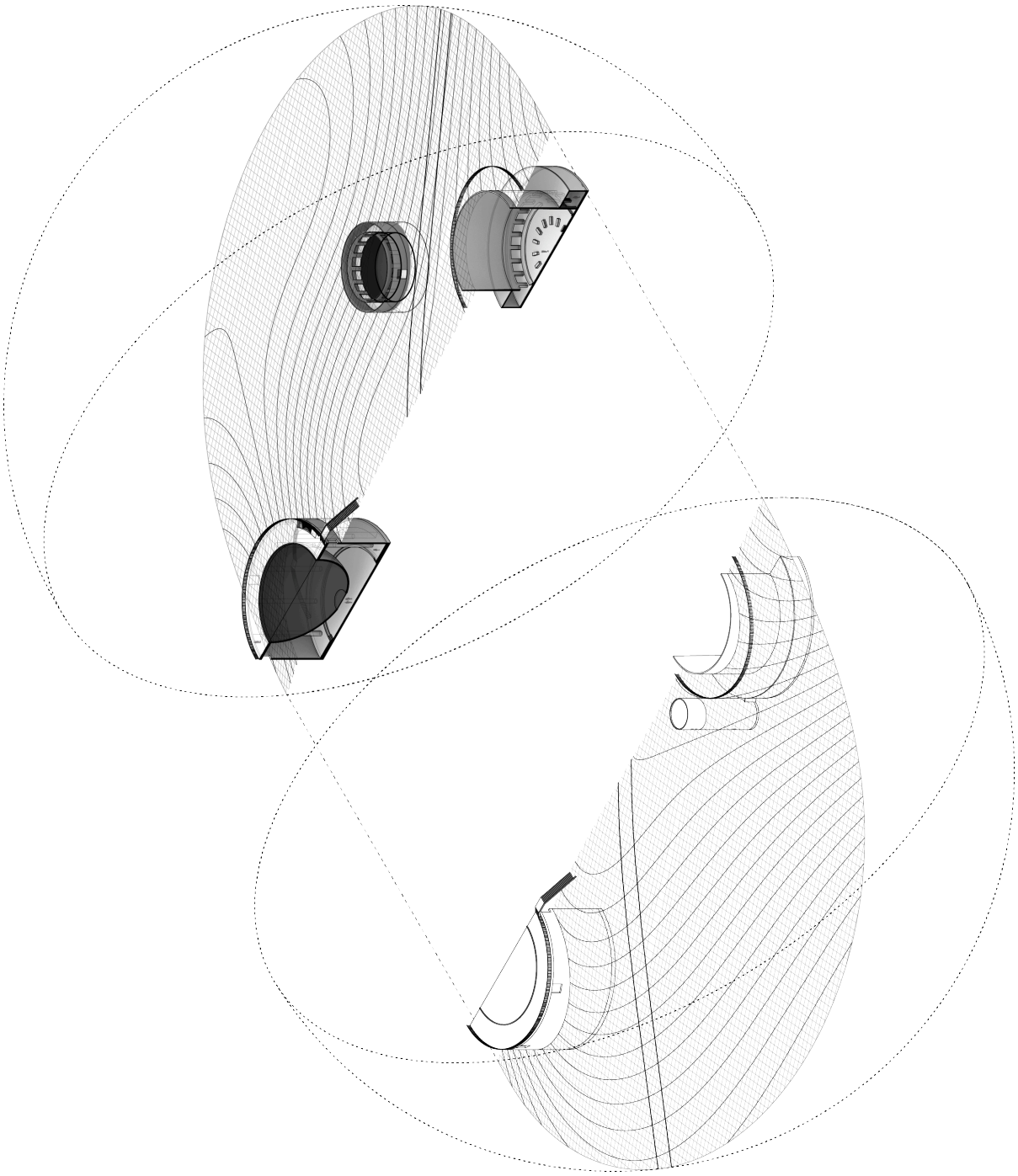

Figure 88. Space A and B isometric cross section

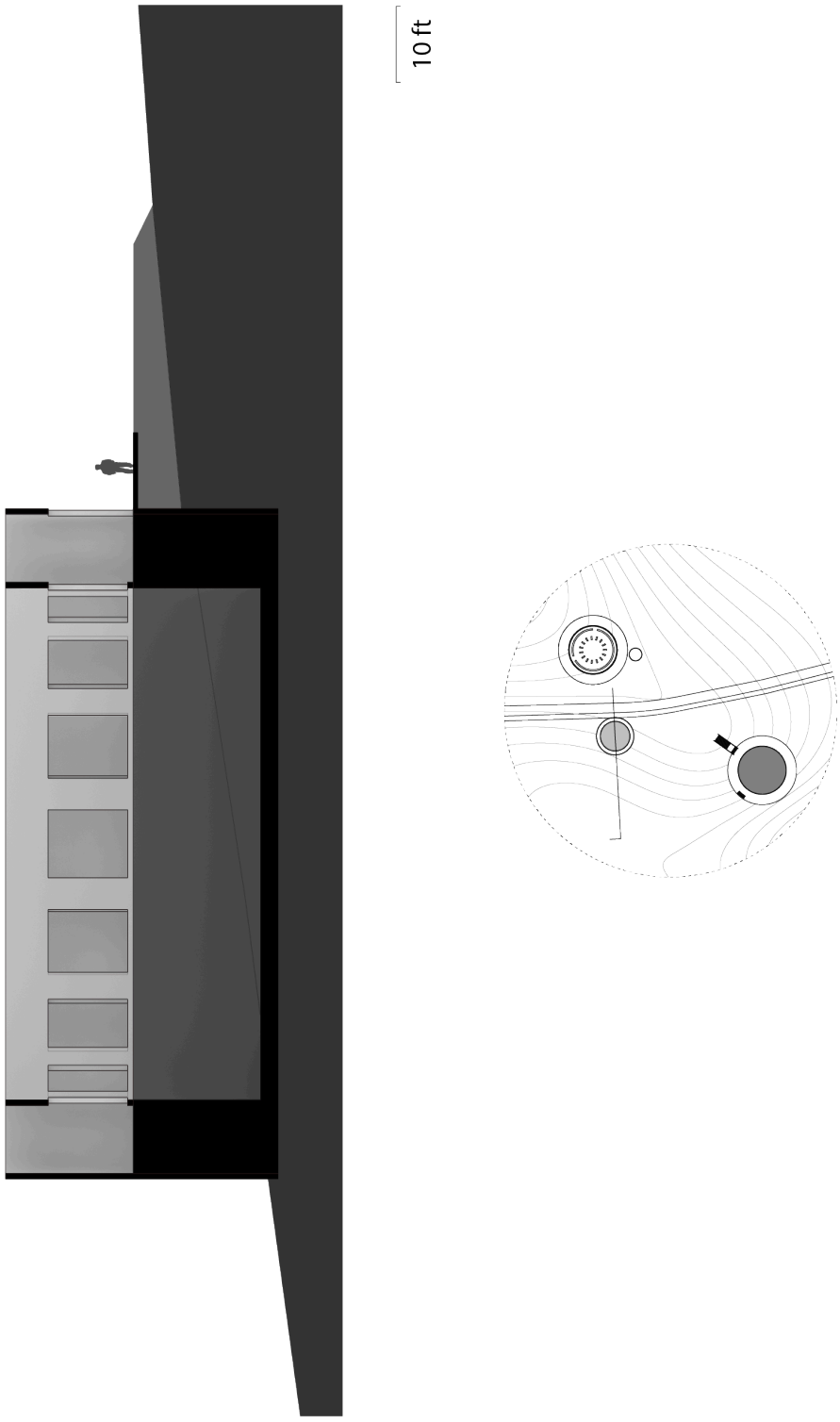

Figure 89. Space A cross section

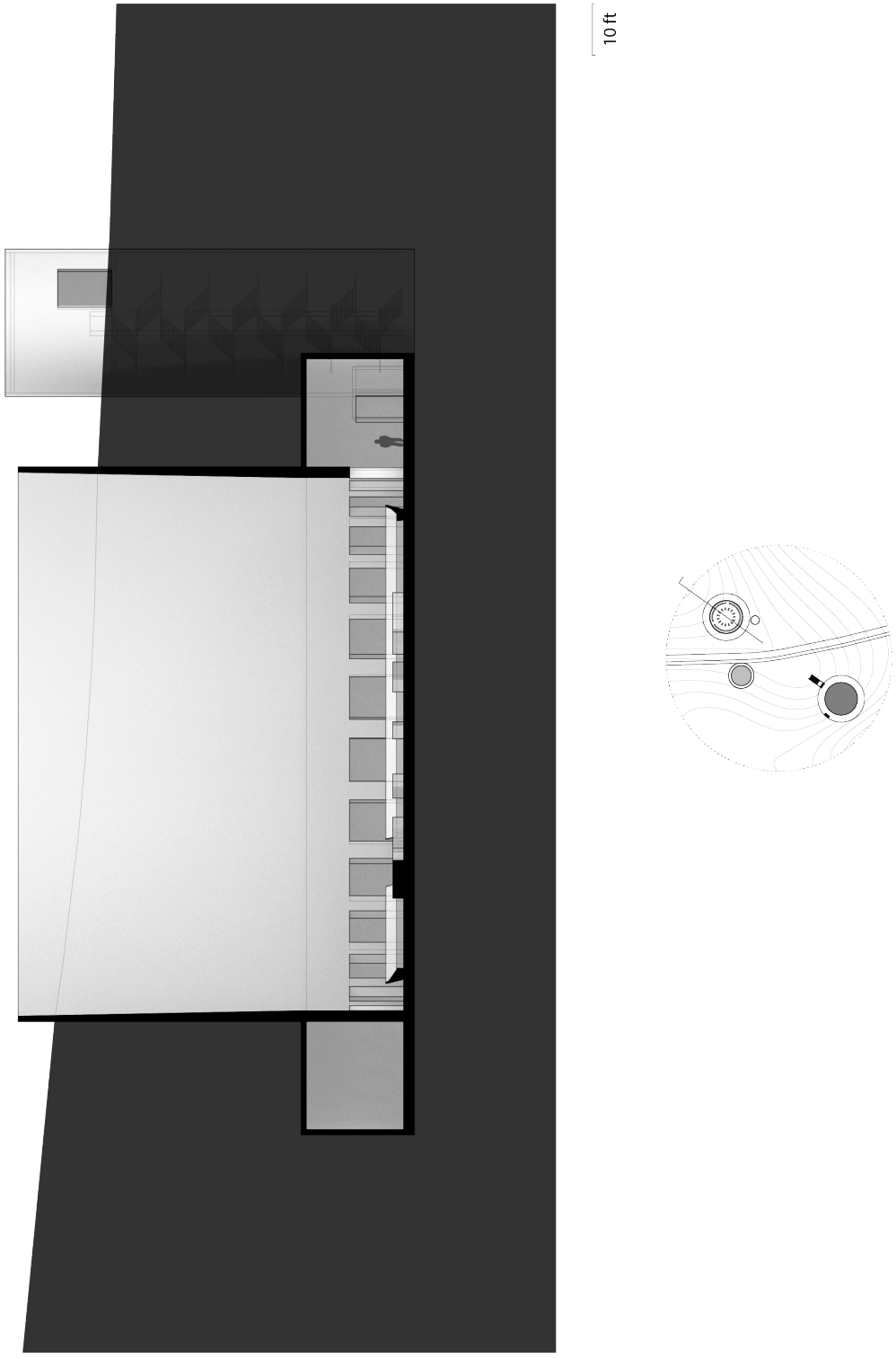

Figure 90. Space B cross section

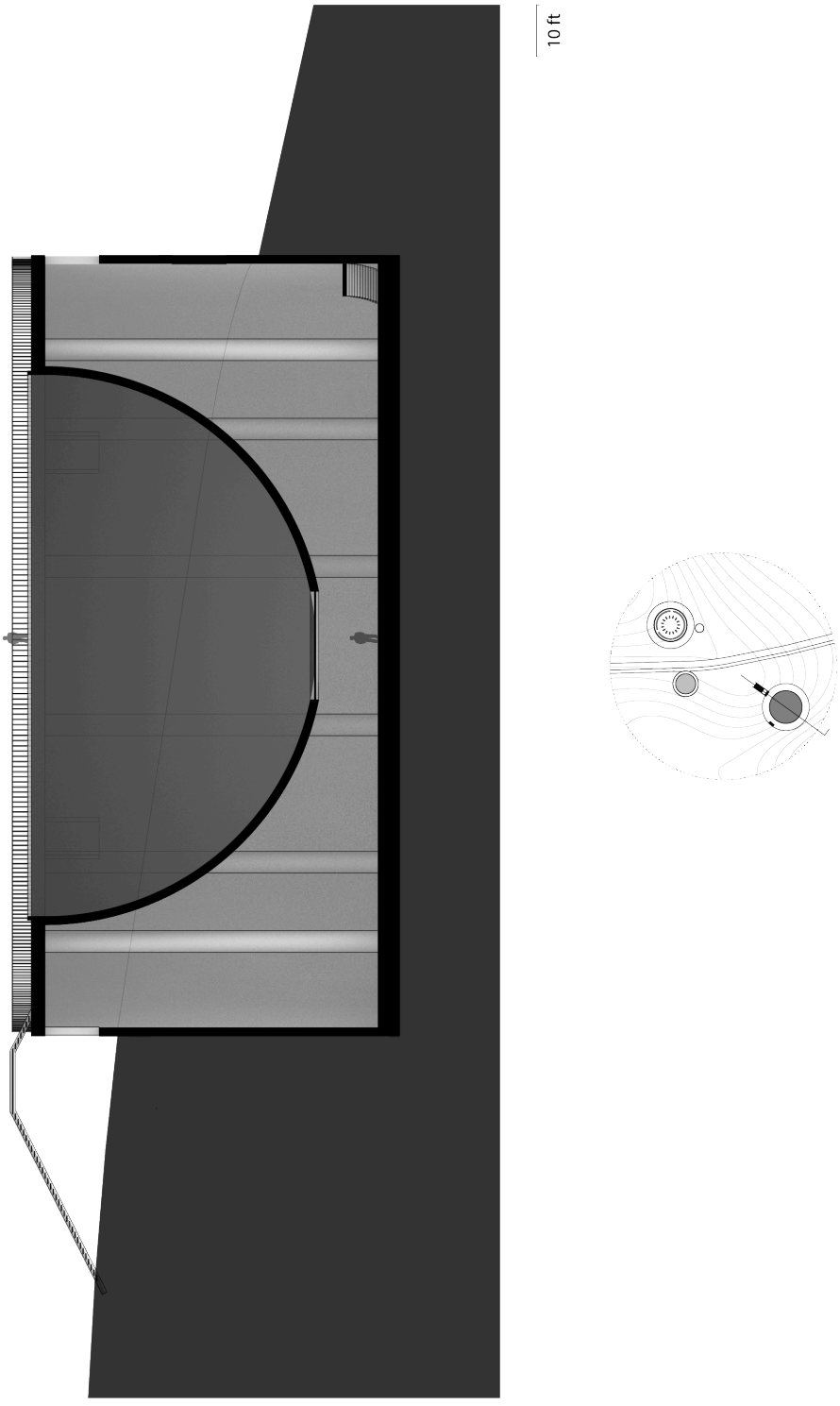

Figure 91. Space B cross section

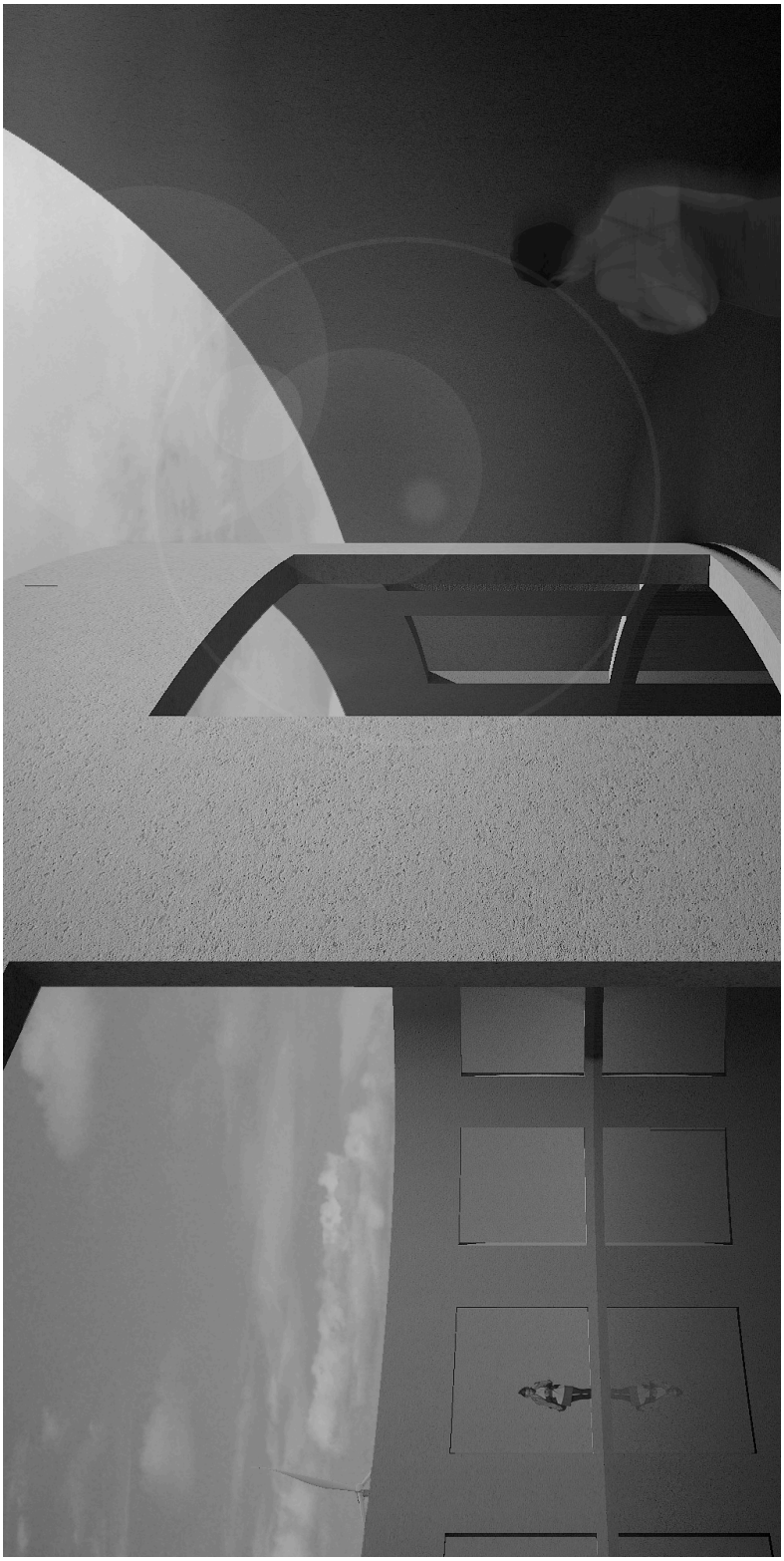

Figure 92. Space A atmospheric perspective

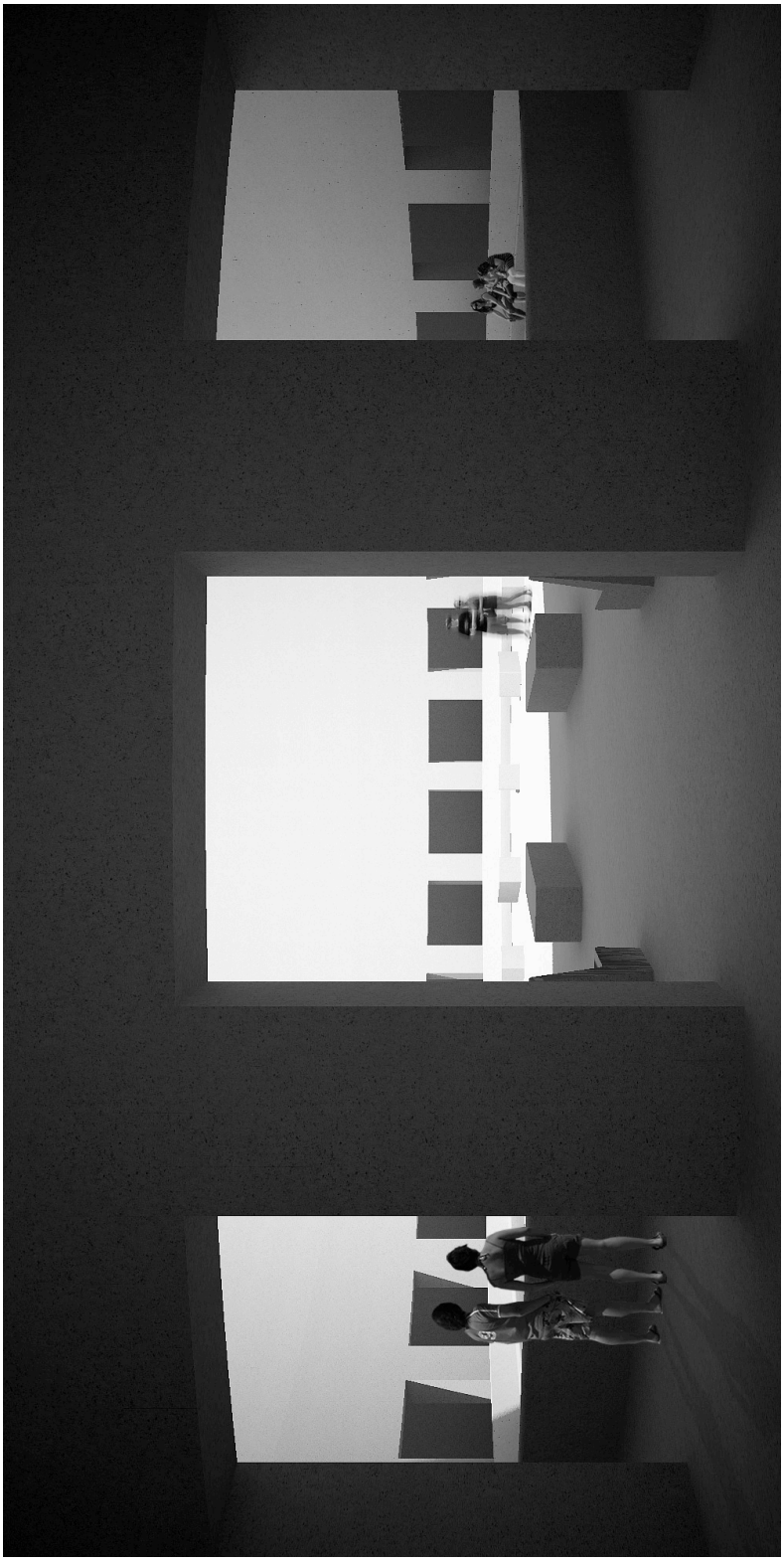

Figure 93. Space B atmospheric perspective

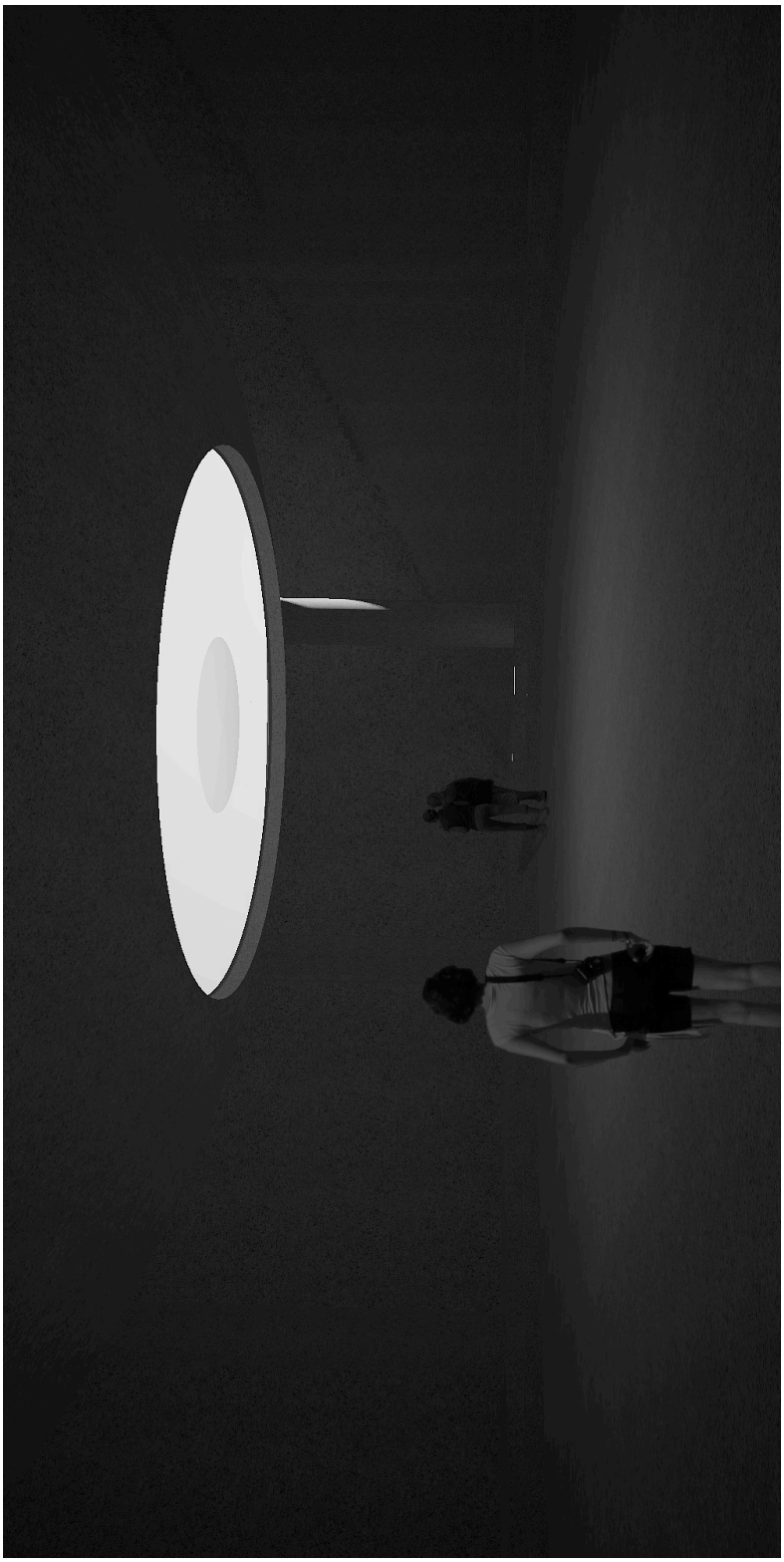

Figure 94. Space C atmospheric perspective

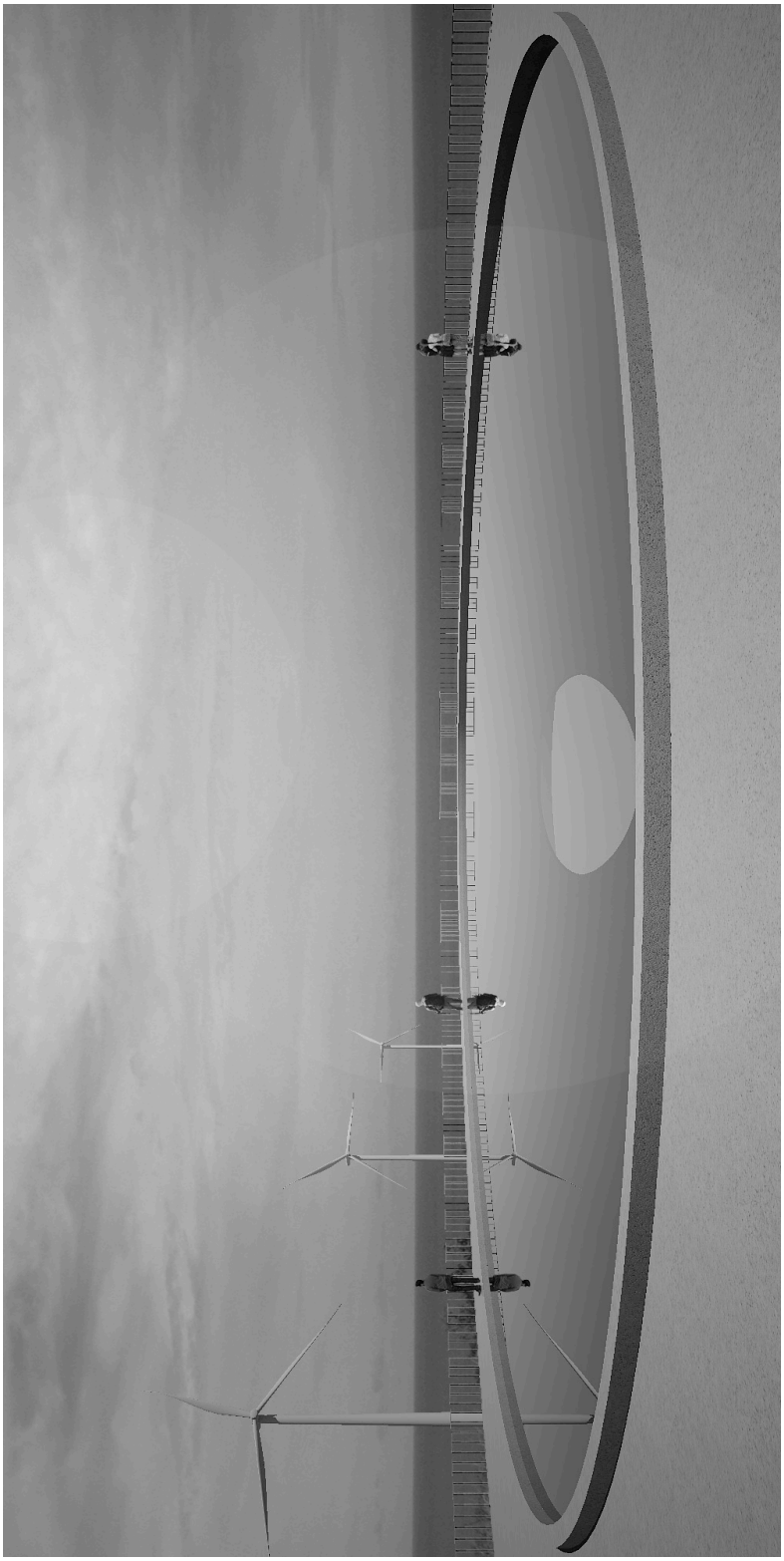

Figure 95. Space C atmospheric perspective

Figure 96. Building complex approach atmospheric perspective

7 Conclusion

7.1 Conclusion

Summary

The research questions asked in section 6.1 are as follows: 1. How easily can Gregory Bateson's theory of pattern translate to the analysis and process of architectural design? 2. If it can be translated successfully, how complex and concise is the experience of the information it can produce in a work of architecture? 3. To what extent can it be inclusive of both formal and spatial dimensions as Eisenman stated is the main challenge of clear meaning in conceptually based architecture? 4. How consistently can it be used in this fashion?

In response to question 1 the design research continued to show (on top of written research) that Bateson's theory of pattern translates well to the analysis and process of architectural design. This is evident in the fact that in designing the interpretation center, the mechanism of pattern could be used throughout the process. For example, many of the concept diagrams that directly informed the design of the center (figures 83, 84, 85, 87) were formed based on the logic formed in chapter 3. In response to question 2, the design research showed that a relatively complex form of information (perception of the floating space) could be produced from the mechanism of pattern. Regarding question 3, the formal and spatial components of architecture could be accommodated by the mechanism of pattern. For example, the natural topography of the site, structural components, and function of the interpretation center were incorporated in the components of redundancy, noise and coding. Finally, while it cannot be answered with a single project, the design research continues to answer question 4 in a positive way. As stated previously, the mechanism of pattern would need to be tested with a range of different concepts in order to determine the consistency with which it can be used in architectural design.

Potential

Consequently, the potential of pattern as a mechanism in architectural design can only be tested in time. Like atonalism required the test of time for it to be viewed as the

'mechanism' that enabled musical genres such as jazz, rock and roll, hip hop, house, etc. to be established (p. 23), the use of pattern as a mechanism to achieve complex concepts in architectural design requires the same component of time. With the assistance of the computer and scripting programs which function based on advanced understandings of pattern or repetition, the time needed to realize the potential of pattern as a mechanism in architecture may be accelerated, however, it is important to understand that the element of pattern itself is what drives the computer and not vice versa. The computer may be the best way to harness the potential of pattern as a mechanism in architectural design because of its efficiency; however, if architects are to untap pattern's *full* potential in architecture (whatever that may be), a fluid, multidimensional, and transdisciplinary understanding of the element in such a way as Gregory Bateson understood it, is necessary first and foremost.

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